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MUNICIPAL ENGINEERING

WATERWORKS PARKS

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DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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ASPHALT PAVEMENTS

THE BARBER ASPHALT PAVING COMPANY

BOWLING GREEN BUILDING
No. 11 BROADWAY, NEW YORK

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1878

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Municipal Engineering

VOLUME XII. MAY, EIGHTEEN NINETY-SEVEN. NUMBER 5.

ORIGIN AND HISTORY OF ASPHALT.

By Bernard Bienenfeld, C. E.

From the first dawn of history even to the present time the origin of asphalt and its kindred substances has formed the subject of speculative wonder in the minds of men. The hand that painted the ark of the deluge with asphalt, both within and without, doubtless moved in answer to the impulses of a brain that pondered over this mystery. And later, when the waters of that universal flood had long subsided and the bones of the patriarch Noah had returned to the dust from whence they came, his progeny as they labored upon the walls of that wonderful Tower of Babel upon the plains of Shimar, doubtless argued among themselves upon the origin of the black and gummy asphalt or slime that served them for mortar. Who can say that it was not the heated strife engendered in that discussion that threw these men into that confusion of tongue to which the sacred historian ascribes the differing languages of the earth?

We are told that the "vale of Siddim was full of slime-pits, and the kings of Sodom and Gomorrah fled and fell therein." If these unlucky monarchs had time for contemplation, they doubtless pondered upon the cause of their misfortune and wondered at what might be the source of this mysterious substance that had entrapped them to their doom. At the present day asphalt pits abound in various lands, and they form the burial places of many a luckless animal or bird that has ventured unsuspectingly upon the treacherous surface of this viscous material, only to be lured to destruction.

All history, both sacred and profane, contains reference to the use and occurrence of asphalt, pitch, slime or bitumen as it was variously called by different writers.

The little box of bulrushes, wherein rested for a brief time the infant form of the law-giver whose precepts form the foundation and the bulwark of our civilization, was rendered secure against the waters of the Nile by a coating of slime or pitch. From time immemorial the boatmen of the Euphrates have made their vessels water-tight by the use of this material. The early Spanish explorers of California tell of the large watercraft, lined with asphalt, that were used by the aboriginal Indians in their fishing expeditions; and they record the natural deposits of this material encountered in their travels.

The great cities of Assyria used asphalt in their vast masonry constructions, in lining their reservoirs and hanging-gardens and also as fuel. Their source of supply was the fountains of Hit on the Euphrates, described by Herodo-

tus. In the valley of Judea, especially from the Dead Sea, large quantities of this substance were obtained and sent to Egypt to be used in building the grand temples of that country, in the construction of granaries and reservoirs, and in embalming the dead.

The *word* "asphalt" is derived from Lake Asphaltites, the ancient Greek name for the Dead Sea. No man can give the origin of the term. There are as many theories in respect to the derivation of the word as there are in regard to the origin of the material itself in nature. From time to time, and especially after shocks of earthquake, large, irregular masses of asphalt detach themselves from the bottom of this sea, and, rising to the surface, float about upon the heavy water until driven by the wind against the shore. In ancient times, caravans were specially engaged in carrying this product into Egypt, bringing back in return the corn and other food products of that favored and fertile land.

Some of the great edifices of Egypt and of Mesopotamia, wherein asphalt was employed, are still intact after the lapse of untold centuries; and the mummies of the former land have successfully resisted the ravages of five thousand years by virtue of their wrappings of asphalt-saturated cloth. The ancient people of Peru also employed this material for embalming their dead.

Many of the writers of antiquity, including Aristotle, Strabo, Plutarch and Pliny, describe the pitch deposits in the vicinity of the Adriatic Sea. References to the deposits on the Caspian Sea are numerous, and the burning springs of that curious region are intimately associated with the religious observances of the oldest nations of the earth. For many centuries these awful fires have been the cause of innumerable pilgrimages by the people of Hindoostan, both to the Caspian Sea and to Burmah, where large quantities of mineral oil have existed from remotest antiquity. The fire temples at Baku on the Caspian and in the Punjab, with their everlasting flames, have fitly symbolized for them a belief and a hope in life eternal. There are descriptions extant of vast conflagrations of oil on the surface of the Caspian Sea, when thousands of square miles of living flame spread themselves before the terrified and awe-stricken spectators.

In China, in the most ancient times, oil has been known as having been obtained while boring wells for salt. This finds analogy in our own country and in recent times, for the first development of oil in America was the result of boring for brine in western Pennsylvania. The Indians were, however, conversant with the existence of natural oil in that region from the earliest times. They attributed many medicinal virtues to it, and it played no inconsiderable part in some of their ceremonials, which resembled some of those of the famed fire-worshipers of Persia.

In the West Indies, and on the bordering shores of South America, there are many large deposits of asphalt, that have been the subject of description and research from the time of the first discovery of America. The Island of Trinidad, a British possession, in the Caribbean Sea, contains one of the most noted deposits of this material in the world. It exists in the form of detached masses, the largest of which fills what appears to be an extinct volcanic crater—the celebrated Pitch Lake of Trinidad. It is about 110 acres in area; its depth is not known. When struck a sharp

A VIEW OF LAKE CALHOUN DRIVE, MINNEAPOLIS.

blow with a hammer the material will fly into fragments, being in this regard brittle. If, however, the hammer be left lying on the surface of the lake it will in time be engulfed and sink out of sight on account of the viscous nature of the asphalt, which in this respect combines in itself some of the opposing qualities that usually pertain only to liquids or to solids.

From this island has been obtained most of the material that has been used in paving the fifteen hundred miles of asphalt streets that are to be found in the eastern cities of the United States, and also in covering many of the better asphalt streets of Europe. No less than one million tons of asphalt have been taken from the Pitch lake within the last twenty years without appreciably affecting the supply. This material must not be confounded with our local bituminous rock, which, though similar in appearance and in origin to the asphalt, is yet vitally different. The asphalt is more pure and apparently fixed in its nature. It appears to be a finished product, and is not readily susceptible to the action of the elements. On the other hand, most bituminous rock appears to be still in a raw or formative condition. It is impure and variable in its composition and its cementing substance is more or less unstable and volatile. It is laid on the street crude without any previous refining, whereas the eastern asphalt practice requires the materials to be carefully selected and refined, and to be laid according to definite formula and in well-considered proportions. The difference between the two systems can best be observed in their results. Many of the eastern asphalt pavements, such as some of those in Buffalo, New York and in Washington, in the District of Columbia, have been in service for over twenty years and are still intact, tending in this respect towards the standards realized by those who wrought in this material in the days of Babylon of old.

Within the last few years California has developed within her borders deposits of asphalt whose purity and extent have astonished the world and whose qualities of excellence have enforced recognition from the experts of Europe and America. It is a matter for self-congratulation that California asphalt is in use in the principal cities of the United States; yet, at the same time, it is a matter for comment that practically none of it has been laid on the streets of San Francisco. Of the four hundred thousand dollars' worth of asphalt produced in California in 1894 and 1895, nearly all was shipped away for use in the cities of the Atlantic states and of the Mississippi valley.

The use of this material by the aborigines of California is probably as old as the race itself. They employed it to water-proof their boats and water jars, and to fasten their arrow heads and spear heads to the shafts. They were also familiar with its value as fuel. The early mission fathers employed it for flooring and for roofing purposes and for lining their water cisterns. It is found in two classes of deposits. The first, called by the old padres "brea" deposits, are large pools or lakes similar to that of Trinidad, although none of the California "brea pools" are as large as those of Trinidad. This Spanish word "brea" signifies pitch. The material is rather impure, although comparing very favorably in that regard with the pitch of Trinidad. It is difficult and costly to refine, and is not much used in

SOUTH DRIVE, LAKE HARRIET, MINNEAPOLIS.

the arts. The second class of deposits comprises the so-called asphalt veins, and from them is obtained the California asphalt of commerce. They occur principally in the counties of Santa Barbara and Kern, and their contained material is invariably purer than that of Trinidad, many of the California crude asphalts being superior in that respect to the refined Trinidad product.

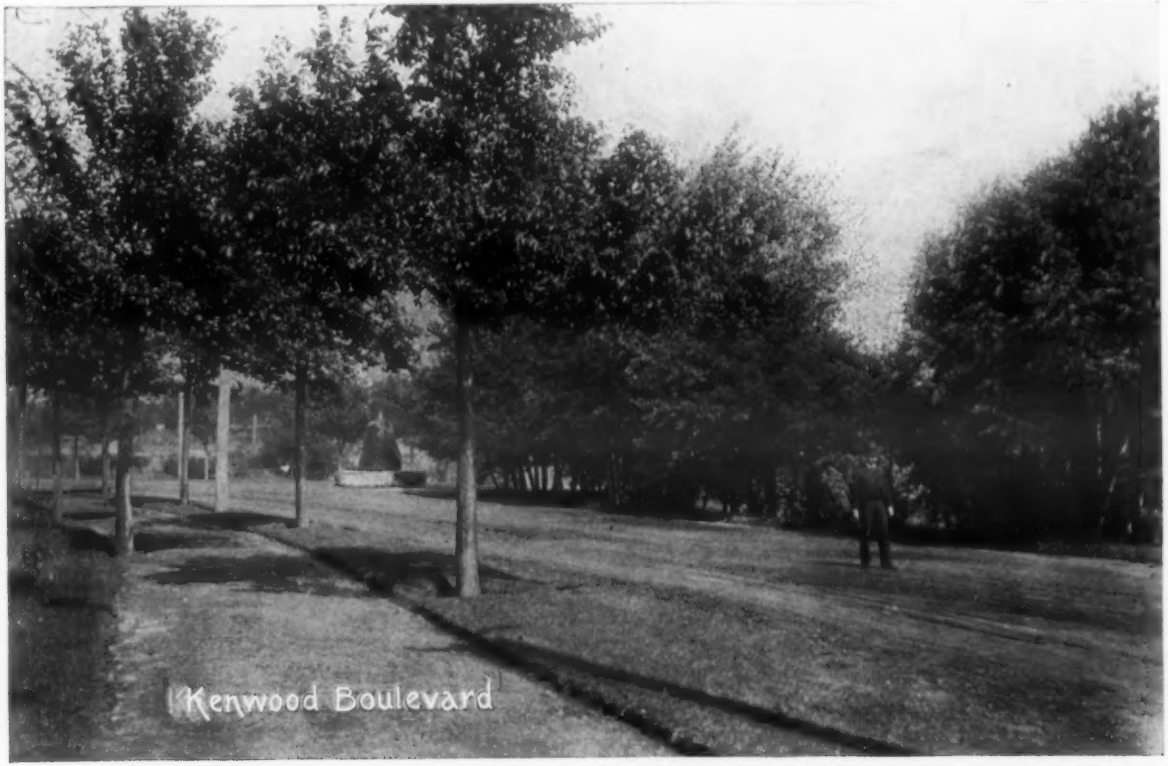
These so-called veins are in reality blanket deposits lying parallel and conformable to the strata of the earth where they are found. On account of the viscous nature of the material, however, it has in places been forced into fissures and crevasses in the surrounding formation so that it is often difficult to mine it. Some of the deposits dip at quite an angle to the horizontal and many of them can be traced by their outcrop for miles on the surface of the ground. They vary in width from a few inches to several feet, some of the veins being in places fifteen feet thick.

Asphaltic materials are found in many of the states and territories of the Union. In fact, in almost every one of them is found at least some member of the oil series. But in none is found anything approaching the asphalt of California. While all of these materials have a certain general similarity and probably a similar origin, there is nevertheless a considerable difference between some of them. Nearly all of the eastern oil members have what is called a paraffine base, and when these substances solidify on exposure to the air, or to artificial heat, a white, waxy paraffine is the result. From this is obtained the paraffine candle of commerce. In nature this material is called mineral wax and it is found abundantly in Galicia, in Austria, and in Utah in the United States. The so-called gum beds of Canada and of the eastern states are a similar formation.

On the other hand, the oil-members of California have, with hardly an exception, a black asphalt base, this material being in many respects a perfect contrast to the paraffine of the east. The paraffine is readily affected by changes of temperature and by the action of water, and is in no respect so stable and permanent as the asphalt, nor has it the cementing and adhesive qualities of the latter. The two seem to be essentially different, and they will not combine either chemically or physically.

For many years it has been customary to use some of those prepared eastern oils to soften or temper the asphalt from Trinidad, but the results have been far from satisfactory. The heavier California oils, the so-called malthas, on the contrary, have been found most excellent for this purpose.

Chemically, asphalt is a compound of carbon and hydrogen out of which elements, all organic matter, both animal and vegetable, is formed. Asphalt is a member of that group of natural substances that includes light oil or petroleum, heavy oil and mineral pitch or bitumen. The great chemist, Liebig, was of the opinion that the diamond also should be included in this series. According to his judgment that gem is formed by the crystallization of pure carbon out of a liquid hydrocarbon. The other natural hydrocarbons, those of the coal series, including graphite, anthracite, bituminous coal and peat, are now well known to be of vegetable origin. Asphalt is merely the condensed and more solid form of some of the heavier members of this group. It is formed by the evapora-



KENWOOD BOULEVARD, MINNEAPOLIS.

tion of the more volatile portions of the thinner hydrocarbons.

The members of this series are found very widely distributed in nature, both over the surface of the globe, as has been shown, and also permeating the rocks below the surface. Bitumen is found in the lava of volcanoes. There is hardly a geographical division of the earth but what has its members of the series, and every geological division of the earth's crust, from the first to the last, contributes its quota to the sum total of our oil possessions. In fact, all modern activity teems and pulses with the possibilities inherited from these relics of a long-gone past, for oil, as well as coal, is of organic origin, and it comes to us as a legacy from the life that throbbed and thrilled in harmony with the symphony of creation, millions of years ago.

Not a single enterprise or undertaking of to-day but what owes its successful conduct to the stored energies of this life of long ago. It has given us fuel for our lamps of research and power for the wheels of industry. It lubricates our engines of commerce. It paves our streets, renders them noiseless and smooth, and banishes the filth and disease of olden times. It protects our houses from the waters of the heavens and from the shafts of the winds; it preserves our water-pipes from corrosion. It insulates our electric wires and renders possible the immense development of modern electrical science. The cylinder of the phonograph, that wonderful invention of recent times, is said to be made of asphalt. Throughout the entire range of human endeavor, on every hand, this heritage of past ages serves us in the fulfillment of our destiny in the progress of the race.

Whence, then, does it come? How was it formed? In that dim and distant borderland, where life has just begun and still is young, where animal and plant are so near alike that they are barely to be told apart, and can with difficulty be distinguished from the surrounding inert and lifeless mineral matter, dwell, with infusoria, minute organisms, many of them so small that a single cubic inch may contain forty thousand millions.

Recent borings in the deposits of the Nile point to the fact that the human race has dwelt upon this planet for more than twenty thousand years; and late researches in the sacred books of India tend to prove almost conclusively that the faith of the Veda was established even before that time. And yet, this hoary antiquity and remote ancestry of our progenitors covers but a moment in the lapse of time that has passed since those organisms, whose fossil substance we muse about, came into the economy of life, and, filling their appointed destinies, returned to primal dust.

In the waters of every pond and lake and sea of to-day swarm those microscopic beings, each species living amongst conditions and environments best suited to its nature. Some seek the bottoms of stagnant pools, others flourish best in pure and wholesome water and in sight of the blue of the sky. Some there are that thrive in brackish ponds and marshes; others, again, find their habitation in the salt ocean—some in the waters near the shore, and others in the depths of the mid-sea, miles below the surface and in regions of eternal darkness. Some love the climate of the torrid zone; others affect the regions of everlasting snow. Everywhere the earth and its waters teem with them.

It is they who first came to people our globe, and in spite of all the

DRIVE ALONG LAKE OF THE ISLES, MINNEAPOLIS.

changes and vicissitudes of time, they still remain. Countless generations of strange beings have come and gone since then. Curious forms have stepped upon the stage of life, have performed their allotted tasks and then in obedience to the blind and inexorable decree of destiny have passed away forever. Many thousand species and genera of animals and plants have seen the light of day, have persisted upon the scene of life for innumerable ages, and at last, in answer to the behest of the immutable laws of evolution, have given way to higher and better forms, these in their turn only to be replaced again by still more perfect and higher developed creations. But these, the lovely ones of life, the first precursors of all things now living or hereafter to be, they live on forever.

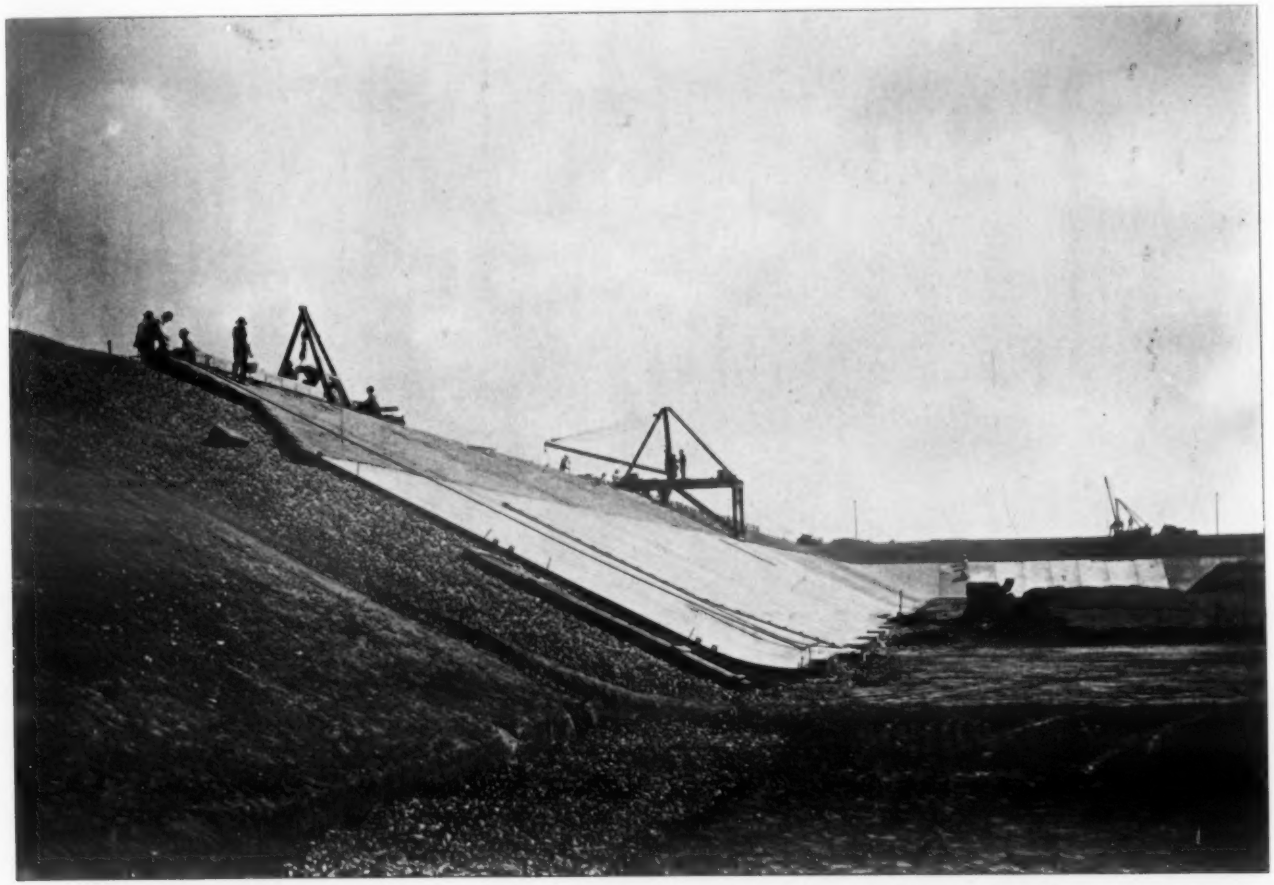
In the oldest of the stratified rocks, the first that were deposited in the depths of the primeval sea, going back to an age so remote that the human mind can frame no expression of its antiquity, are found the remains of the eozoon, the animal of the dawn of creation, a member of the infusoria; and related members of the same group of organisms survive to-day.

This division of nature contains the diatoms, signifying "those that are cut in two," and the protozoa, meaning "first animals." The diatoms are so called because they have two shells, which give them the appearance of being divided in two. This shell material, which is merely the enveloping or covering medium of the organism, is composed of silica or pure quartz. Inside of the shell is the living thing proper, which consists of a single cell of protoplasm. Throughout this plasm mass are scattered globules of fat or oil. The diatoms are now classed among the vegetables or plants, although for a long time this was a much disputed matter. When the plant leaves its shell, the latter, being composed of indestructible quartz, remains behind, sinks to the bottom and is preserved, whilst the living matter or protoplasm passes through all the changes incident to living tissues. In this manner vast masses of diatom shells are being continually deposited at the bottom of all bodies of water, both fresh and salt. Some of their forms are of surpassing beauty. They are exceedingly minute, many of them being less than the one-thousandth part of an inch in diameter.

The protozoa or animal members of the infusorial division are less regular in shape than the diatoms. They also consist of a protoplasm cell and usually have a shell of silica or of lime carbonate. Many orders, however, have no shell, and when they pass away, leave no vestige behind them.

The protoplasm matter of these animals also contains oil-globules scattered throughout its mass. The great chalk formations of the earth are made entirely of the remains of some of the protozoa, whilst the flint nodules found in the chalk are the concreted remains of different orders of the same class of beings. When it is remembered that many of these chalk formations are thousands of feet in thickness, and the organisms composing them are microscopic in size, it will be realized how vast must be the extent of time and how innumerable the generations of animals required to have produced such a formation.

The ooze at present being deposited on the floor of the Atlantic ocean is composed entirely of protozoa, the greater part being calcareous or lime carbonate, similar



DERRICK SETTING COPING AND SHEATHING OF MINNEAPOLIS WATER RESERVOIR.

to that of chalk, about ten per cent. being siliceous and similar to the infusorial earth found in the island of Barbadoes.

This condition also exists in the Pacific ocean out to a depth of two miles. Beyond that, out in the abyssal depths the ooze becomes more siliceous in character; and at a depth of five miles, it is composed entirely of the remains of organisms having siliceous shells. A cause for this is found in the increasing saltiness of the ocean at the lower depths. This acts upon and dissolves the lime of the calcareous organisms, but does not affect those composed of silica. The low temperature prevailing at the bottom of the ocean tends of course to preserve the dead organic matter that may be there.

In the West Indies and in California, wherever asphalt is found, there also exists large deposits of marine infusorial earth—deposits that in past geological times have been formed from infusoria at the bottom of the sea, and that have been subsequently elevated into dry land. Some of those infusorial deposits are many feet in thickness and they are usually geologically below the asphalt.

All of the California asphalts themselves, and probably those of the West Indies, contain infusorial earth, disseminated through the mass of the hydrocarbon. What is more natural to suppose, then, than that the vast quantities of diatoms and protozoa, that have left their bony skeletons as infusorial earth, have yielded up their organic matter, and especially their contained oil globules, to the formation of asphalt?

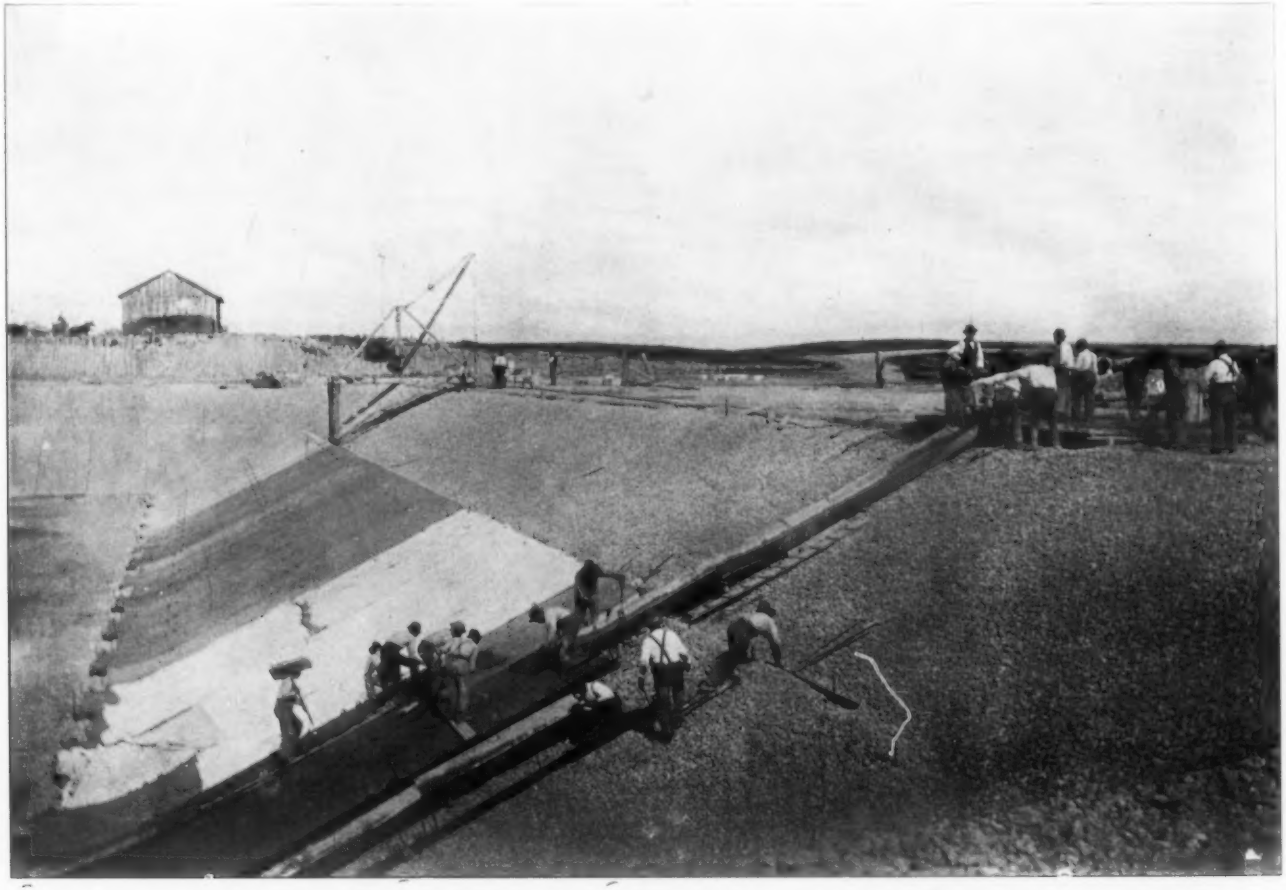
The chemical elements contained in protoplasm are identical with those composing asphalt, although they do not exist in the same proportion in both substances, which of course is to be expected, since if the asphalt has been formed from the protoplasm it has undergone some chemical change.

Recently, two substances have been derived from asphalt that have been obtained hitherto only by the distillation of animal remains. And by the heating of fish-oils under pressure chemists have been able to produce the members of the paraffine oil series.

It would therefore seem that all the evidence points strongly to the infusorial origin of asphalt; for no other source suggests itself as capable of yielding the amount of organic matter that has been necessary to produce these large asphaltic deposits. And, furthermore, the infusoria must have been marine and not fresh water, as is shown by the marine character of the infusorial remains here associated with asphalt, and by the constant association of salt with asphalt and with all other members of the oil series.

Just what the process was that transmuted the life substance of these organisms into the asphaltic material we can not yet say. Future research will doubtless answer that question; and will also tell us why some organic deposits may produce asphalt and others not; why some may produce the light paraffine oils, and others the heavy asphaltic substances.

There is food for contemplation in the thought of how these first-born of earth, these pigmies of creation, have striven and wrought their destinies on the field of life, so that we, the appointed masters of all things mortal, should in the fullness of time achieve the greatness of the present day, only again perhaps to pave the way for higher, nobler and better types of the ages that are to come.



PLACING CONCRETE ON SLOPES OF MINNEAPOLIS WATER RESERVOIR.

GERMAN IRON SLAG PAVING.

By Robert Grimshaw, C. E.

Iron slag pavements (not to be confused with those made from high-furnace slag, mixed with loam or fire clay, pressed and glazed, and used as paving blocks) can only be used where iron slag is plentiful and cheap and traffic light; that is, principally for town and village streets and roads.

The slag (which can not be used if glassy, but must first be "tempered" or "basalted," causing it to lose much of its strength and toughness) is broken with the hammer into pieces of as nearly uniform size as possible. This causes great loss of material, but as the stuff is cheap* this matters little. The material is then spread on the road-bed and rolled, and, where bog-iron ore is plenty, covered with that. Curb or border stones are never used. The thickness of the slag layer is about 25 to 30 cm. = 10 to 12 inches. The running meter of street costs about 2.5 to 3 marks = say 55 to 68 cents per yard; the streets being ordinarily 3.5 meters = nearly 11.5 feet wide. Like the bog-iron ore roads they are durable, and as they are cheap, are to be recommended for localities where the material is at hand.

Where the street or road is for heavy traffic, it must be given a layer of broken stone, and well rolled. Such roads, with iron slag foundation layer and broken stone surface metal, stand heavy traffic quite well.

*Say 1.50 marks = 36 cents per cubic meter = 1.31 cubic yards at the mines.

METHODS OF CEMENT TESTING. II.

In the April number of MUNICIPAL ENGINEERING we published the first installment of letters from cement experts answering a series of questions submitted by us relating to methods of testing cement. Below we give another installment of such answers, which, together with others heretofore published, will be critically reviewed in this magazine later.

The questions are republished below, and the answers by different writers follow:

Test for Fineness—Sieves.

(1) What size of mesh should be used in testing fineness?

Weight Per Cubic Foot.

(2) Is the test of weight per cubic foot of sufficient value to be retained, and if so, what method should be employed?

Specific Gravity.

(3) Do you consider the test for specific gravity of value (a) for Portland? (b) for natural cement?

(4) What form of apparatus do you prefer for this test.

Chemical Analysis.

(5) Under what conditions do you consider a chemical analysis essential?

Time of Setting.

(6) What do you consider the best method of determining the consistency of mortars for this test?

(7) Should the time of setting be determined for mortars containing sand as well as for neat cement mortars?

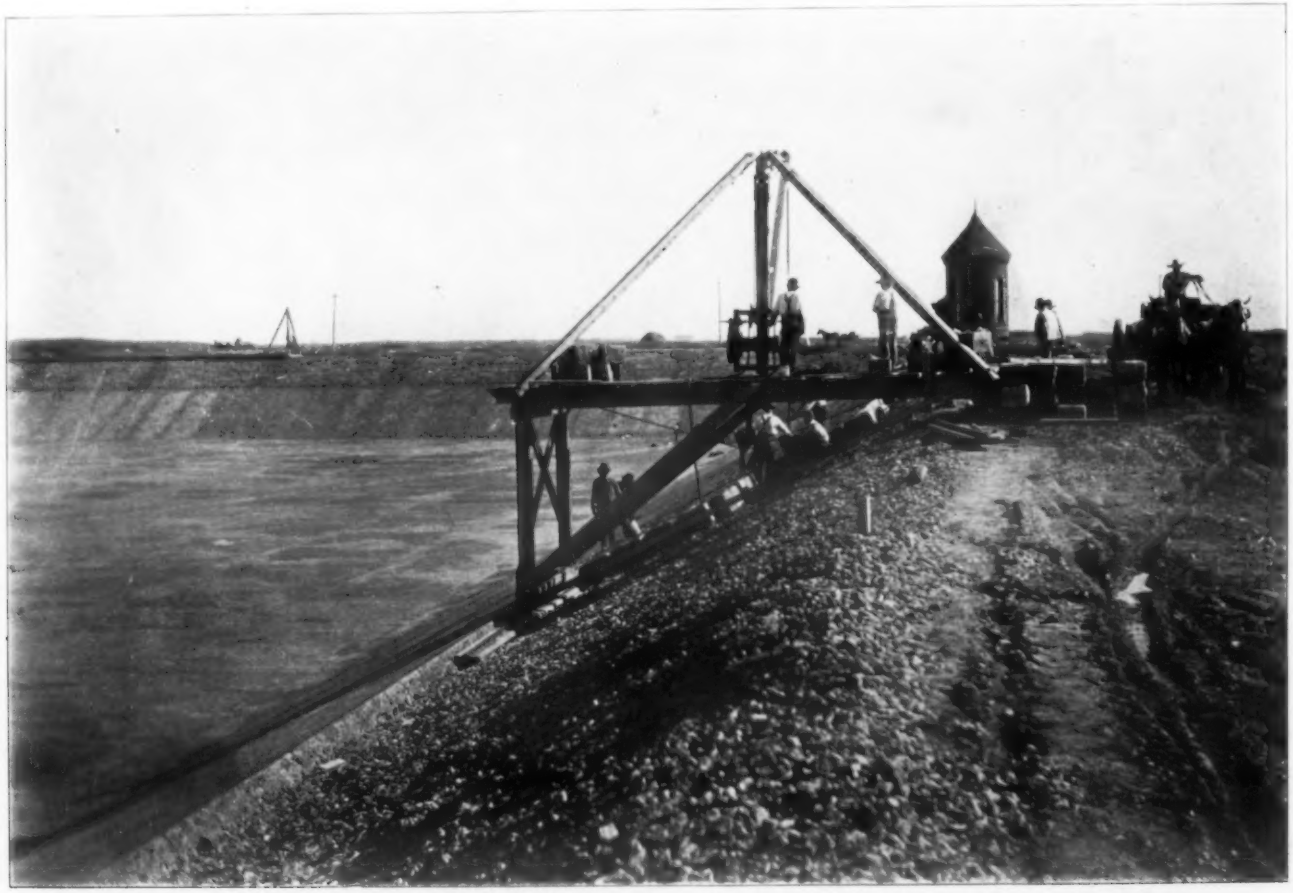
(8) What method do you prefer for this test, and what special conditions are desirable in its execution?

Soundness.

(9) What in your opinion constitutes a practical and sufficient test for soundness, (a) of Portland? (b) of natural?

Tests of Strength.

(10) What do you consider the most



DERRICK USED FOR SETTING PAVING OF MINNEAPOLIS RESERVOIR.

valuable strength test that is practicable to execute under ordinary conditions?

(11) Do you consider that the form of mold recommended by the American Society of Civil Engineers' committee in 1885 for tensile tests, and now in general use in this country, can be improved, and if so, in what direction should modification be made?

(12) How may the consistency of the mortar be defined and determined so that different laboratories may employ mortars of the same consistency?

(13) What do you consider the best method of mixing mortar for tensile or other tests?

(14) What method of filling the molds and finishing the specimens will give most nearly uniform results?

(15) What special precautions should be taken with the briquettes from the time of molding until they are ready to break?

(16) What form of clip do you prefer for breaking briquettes in tension?

ANSWERS OF J. W. WOERMANN, C. E., UNITED STATES ASST. ENGINEER.

Mr. J. W. Woermann, C. E., United States Assistant Engineer on the Illinois and Mississippi canal, sends from Sterling, Ill., with his answers, the proportions ordered by Major W. L. Marshall for use in the construction of the canal, as follows:

"(a) *Portland Cements*—Neat: 20 ounces cement by weight, 4½ fluid ounces water, mixed to a resemblance to freshly dug earth. Sand: 5 ounces cement by weight, 15 ounces sand by weight, mixed dry until it seems to the eye thoroughly mingled; 2½ fluid ounces water, mixed for five minutes.

"(b) *Natural Cements*—Neat: 20 ounces cement by weight, 7 fluid ounces of water, mixed to a resemblance to freshly dug earth. Sand: 10 ounces cement by weight, 10 ounces sand by weight, mixed dry until it seems to be thoroughly mingled; 3½ fluid ounces water, mixed wet for five minutes."

Mr. Woermann's answers are as follows:

1. 100 meshes per lineal inch.

2. Interesting, but not necessary.

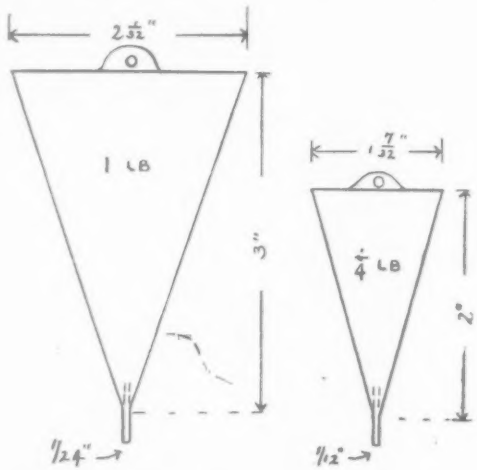
3. Other things being equal, would prefer the heaviest cement, but do not consider it of much importance.

4. No special form.

5. None.

6. Determine by experiment the percentage of water which gives the greatest strength for the cement under consideration, and use that percentage in making these tests. (Also see note in letter.)

7. Not necessary.



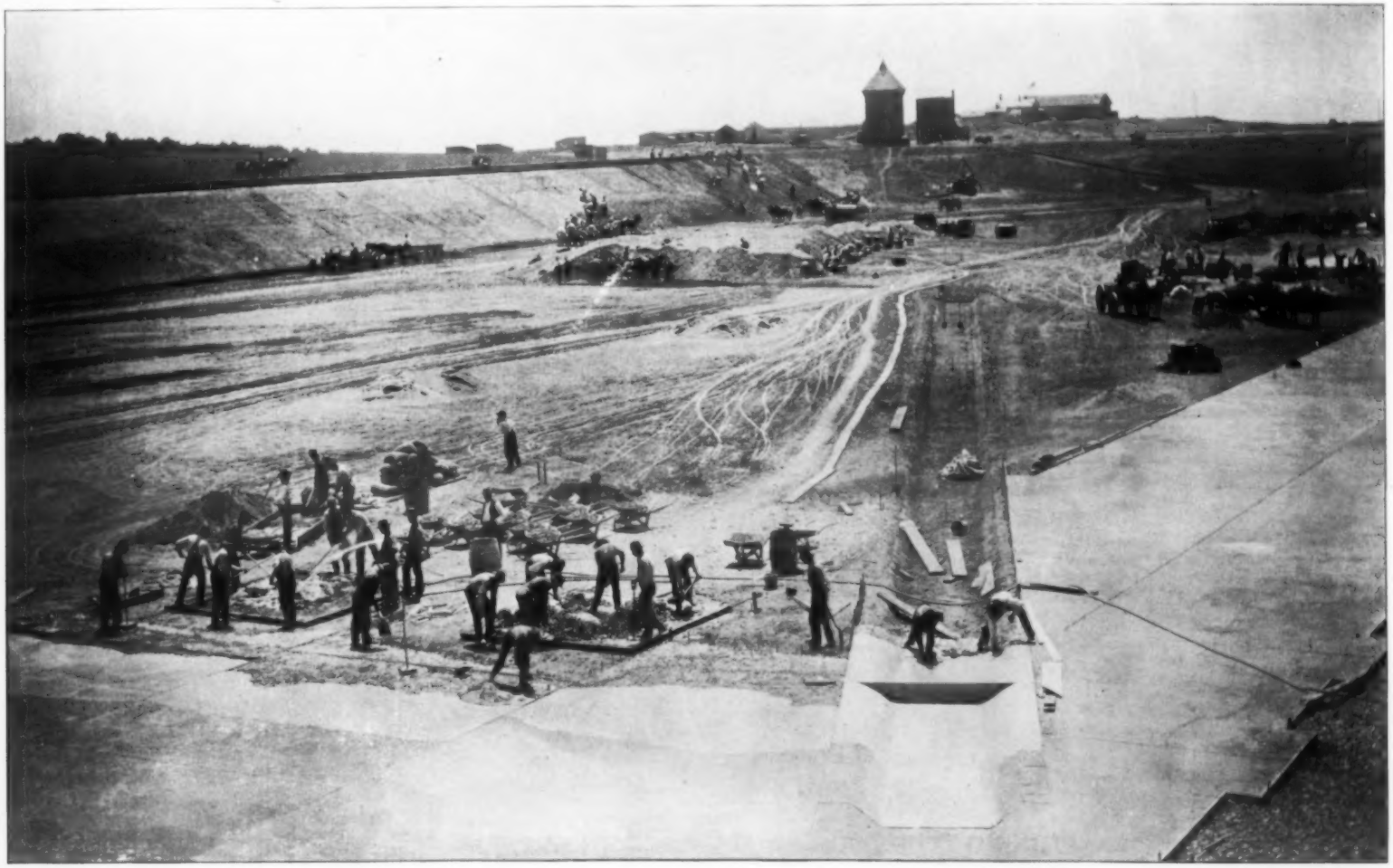
8. Vicat needles, as recommended by Am. Soc. C. E. The forms shown in sketch were devised by Lieut. Henry Jerney, Chicago, for use in testing cement on Illinois and Mississippi canal.

9. Thin cakes of neat cement exposed in air and water, etc., as recommended by Am. Soc. C. E.

10. Tensile, or cross-breaking. —Comparative crushing tests are probably more valuable in some kinds of construction but they require too expensive a plant.

11. Undecided.

12. Probably the best that can be done is to adopt some empirical rule, for example that of Booth, Garrett & Blair, of Philadelphia: "First, determine by pat tests the proper percentage of water for the



TRIMMING THE BANKS AND CONCRETING THE BOTTOM OF BASIN No. 2, MINNEAPOLIS.

neat cement, then reckon at 7 per cent. the amount of water required for the sand." (Also see Maj. Marshall's rules in letter.)

13. Mix with trowel; 2 min. for quick setting, and 5 min. for slow setting cements. By quick setting here I mean those where "initial set" would take place in less than 10 min. So that practically it would require mixing for 5 min., except for some special cement. A simple mechanical mixer would be very desirable.

14. According to Prof. Ira O. Baker's experiments, the Boehme Hammer apparatus gives uniform results and high strength; S. Bent Russel's lever machine uniform results but comparatively low strength. In the absence of a machine a definite number of blows from a rammer of given weight (say 1 lb.), given area of face (say ½ sq. in.) falling by its own weight a given distance (say 1 in.).

15. Cover with wet cloth for 24 hours, then carefully place them on edge in water, and renew water at least twice a week. Testing room and water should be at temperature 60° to 70°. Placing them on edge allows the water to have readier access to the whole surface.

16. One with pivots at each side to prevent bending strains as much as possible.

FROM S. BENT RUSSELL, WATER COMMISSIONER OF ST. LOUIS.

1. 100 to the inch.

2. The test has value in a comparative way, but is of no use for record. I would favor using a box holding one cubic foot and packing it as thoroughly as possible with the dry cement.

3. The relative specific gravity of cements should be known when their strength in sand mixtures is to be compared so that the light weight cements may not have undue advantage. I would omit it from a standard specification.

5. Under all conditions in important works, if Portland cement is used.

6. All such tests I consider unreliable for record. They should be used only in simultaneous comparative tests. The effect of temperature on time of setting seems to be greater with some cements than with others. This is a point of some practical importance and would bear investigation.

7. No.

9. *a* (1) A chemical test for magnesia; (2) pats on glass exposed in moist air until set out, and then put in water, as recommended by A. S. C. E. Com.; (3) briquettes placed in water as soon as mixed, while yet in the mold. If they do not swell the cement is sound. (*b*) Pats on glass, same as 2*a*.

10. Twenty-four hours in air and six days in water. Tensile strength of neat cement, with the proper mixing and treatment. Allowance should be made for fineness and chemical composition in comparing such tests.

11. All things considered I doubt if the form can be improved.

12. By using a standard form of mechanical mixer and defining the amount of work to be put in the batch and the appearance of the mortar when the mixing is done. This method, although in my opinion it is the most promising, will not give precise results with cements of very different character.

13. That now in use by the St. Louis water department known as the "cement jig" and run by power.

14. The more mechanical the method the better. I should think the most promising plan to be that used in machinery pressed brick when the brick are first roughly

FINAL ROLLING OF THE EAST BANK OF BASIN No. 2, MINNEAPOLIS.

molded by hand or machine and then repressed. This idea is used by the St. Louis water department in making briquettes.

15. They should remain in the molds until set hard enough to mark with a No. 2 Faber pencil, kept in moist air at a temperature of 70° F. for twenty-four hours, kept in water at a temperature of 70° F. until broken.

16. The form used by the St. Louis water department. This is an articulated clip having a parallel motion so as to balance the pull on the bearing points.

FROM A. S. COOPER, C. E., U. S. ASSISTANT ENGINEER.

1. About 80 per lineal inch for natural cement and 120 for Portland cement.

2. No.

3. No.

5. Where the expansion of the finished work constitutes an element of great danger, the only sure method of detecting the presence of magnesia and free lime, that is, an excess of magnesia, is by chemical analysis. Otherwise the test of analysis is of more importance to the manufacturer than the engineer, as a loss of strength can be found by other tests.

6. The time of set is only important when that time is so short as to cause injury to the mortar before it can be put into the work. It is best determined by the temperature produced by the chemical action of the different elements in combining or setting.

7. No.

10. The only proper test of strength is the compression test, and I think should be substituted for the tension test now generally used. If there are no means at hand to apply the compression test, of course the other is better than nothing.

11. The present form of molds is, I think, as good as can be made.

12. This can either be determined by the amount of penetration of a fixed size and weight of a rod into the mortar after mixing and being placed loosely into a glass, or by mixing until a given number of blows of absolutely the same force (measured by machinery) will bring water to the surface of the briquette.

13. For sand tests it is better to mix the sand and cement together thoroughly by machinery and work the water in with a trowel, on a stone or iron table.

14. The most uniform tests are unquestionably obtained by the German hammer machines, and I believe it should be generally adopted, but it should be simplified.

15. The briquettes should be kept in moist air until thoroughly set, and at a temperature of between 70° and 80° F., and then immersed in water of a uniform temperature, and frequently changed, or in a large tank into which a small stream of water is constantly flowing.

16. Riehle Bros.' roller clips.

FROM G. BOUSCAREN, CONSULTING ENGINEER, CINCINNATI.

Mr. Bouscaren states that his answers apply to current testing, not to laboratory tests:

1. No. 1 50, 74 and 100 as per report of committee A. S. C. E. No. 100 alone for preparation of briquettes for testing.

2. Not necessary.

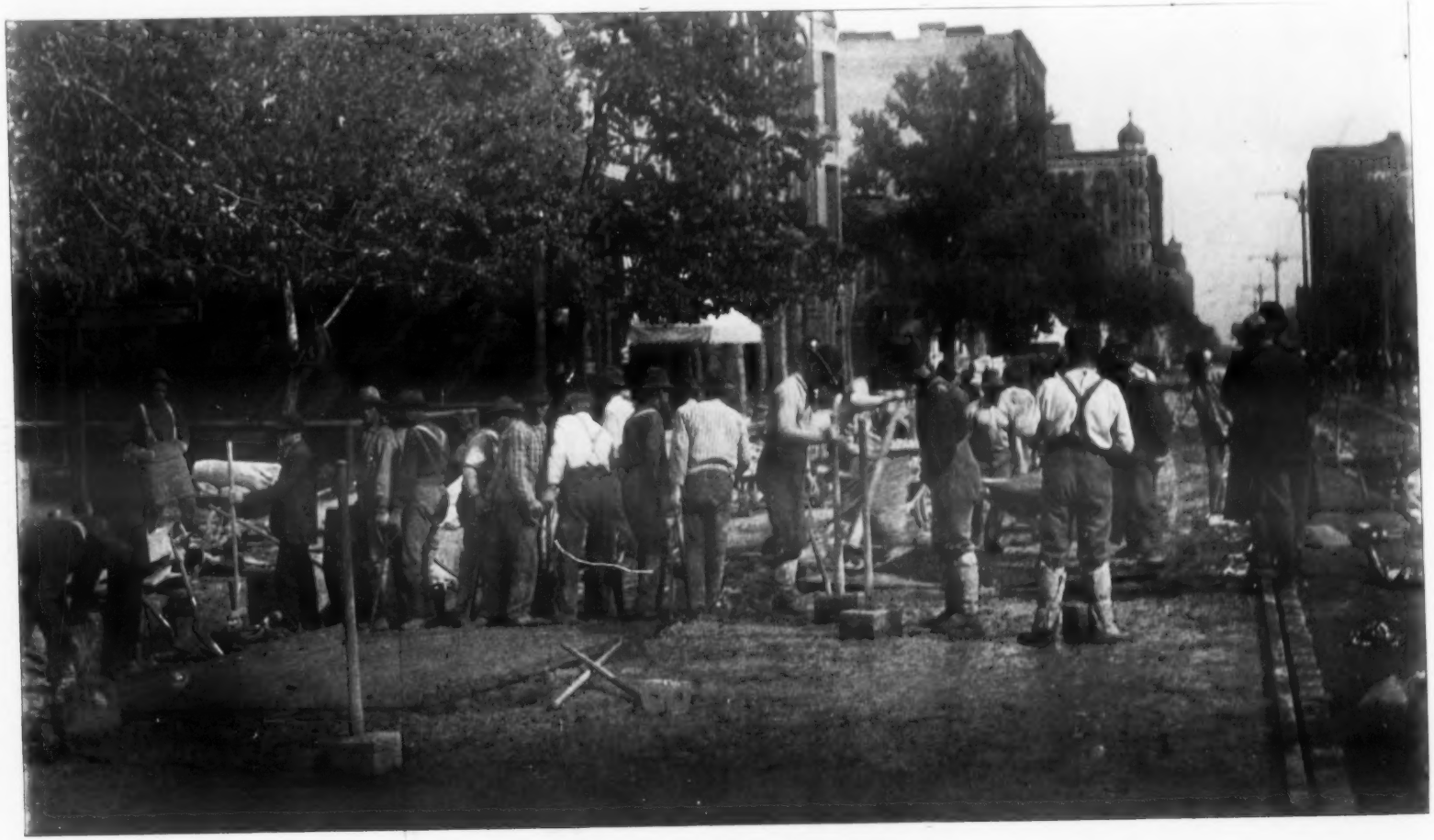
3. Not necessary.

5. Where an excess of sulphate of lime is suspected.

6. Prepare the specimen in the same manner as for tensile test.

7. Yes.

8. Use needle test as recom-



LAYING A CONCRETE FOUNDATION.

mended by General Gillmore—temperature 60° to 70°.

9. Test for tensile strength—immerse specimen after setting for two or three hours in water at temperature of 160° to 180° F.

10. Tensile test for reason of convenience; compression test if practicable would be the most desirable.

11. I would prefer a short length *l* of uniform section.

12. In the same percentage in weight of water.

13. Rapid and mechanical mixing—time of mixing and filling the molds three minutes.

14. Fill the molds mechanically, using a constant finishing pressure on specimens.

15. Exposure for one hour or one day in air at 60° to 70°, then immersion in soft water at same temperature until ready for test, whilst exposed to the air the molds should rest on glass or metal, and they should be covered with a net cloth.

16. Clip recommended by committee of A. S. C. E. with swivel joint.

THE MODEL SYSTEM OF BOOKKEEPING FOR WATER COMPANIES. III.

THE RATED WATER REGISTER.

In the April number a description of the metered water register was given. While there is a growing disposition upon the part of those interested to extend the use of meters as rapidly as possible, still, at the present time, in most cases, by far the greater number of consumers are supplied with water at an annual or flat rate, the service rendered being charged for upon the basis of a fixed schedule, which is regulated by the number of taps used, or the character of the service to be given, as distinguished from that class of patrons who pay upon the basis of actual consumption only as determined by meter readings. Accounts with the former class are kept in the rated or flat rate register, and this register should be sufficiently elastic to admit of a full response to the varying demands upon it, without elaborate explanations or frequent and disfiguring alterations or erasures.

The flat rate register, being the most important of the consumers ledgers, is the only one used by some companies, and there have been many methods devised for providing in it for service not strictly within its province. Where it is the practice, however, to render meter bills or bills for special service at intervals differing from the uniform periods for charging out service at flat rate, it is far simpler to separate the accounts instead of attempting to combine them.

While it is the custom in most cities to render flat rate bills quarterly, it is by no means the universal practice, many companies make semi-annual collections only. Windsor (Ont.) and Salt Lake City, both of which submitted most admirable forms of office blanks in the recent prize competition by MUNICIPAL ENGINEERING, belong to this class. At other points the local conditions seem to make necessary the rendering of monthly bills. This is the practice notably

at Los Angeles (Cal.). An officer of the Los Angeles City Water Company in transmitting to MUNICIPAL ENGINEERING a set of blanks used by that company gives a very clear statement of the method of handling accounts there, which will be found appended to this article.

The flat rate register like the metered register described in the April number of MUNICIPAL ENGINEERING, is a book of original entry, in the sense that charges are first made here to individuals and by a journal entry are all grouped into a grand total, which is charged to the rated consumers' account and credited to the water account in the general ledger. Necessarily in the handling of a multitude of small accounts there are many claims for rebates, allowances and other drawbacks upon the part of the patron, or of inadequate charges upon the part of the company. If the general ledger, which is kept in balance, were loaded with the responsibility of these individual accounts, these supplementary entries would be a source of trouble and annoyance that would make it almost an impossibility to take off a correct trial balance at any time. Columns should therefore be provided in the consumers' register for entries of additions or reductions, with space for explanatory remarks in order that the original charge and any subsequent alteration of it may be seen side by side, together with the reasons therefor, thus having the entire history of each transaction in one place where it may be referred to at any future time, if needed, and yet without assuming the risk of throwing the books out of balance by some chance clerical error. In the accompanying illustration is shown the rated water register of the American Water-Works Standard Bookkeeping System, as devised by MUNICIPAL ENGINEERING, which will practically answer the demands of nearly any water company in existence. It is not specially original in many of its features, as the first page of it, particularly, is very similar to that commonly in use. It does, however, contain, in the most economical and condensed form, a fuller and more complete record than any other, so far as known. As the lines run throughout the two pages, the chance of making entries upon the wrong line is lessened by numbering them at the edges and center of the book. The column for service or register number is given a prominent place at the left of the page, to be followed by the number of the street and then the patron's name, indented upon the upper line, the name of the street being written flush with the edge of the wide column upon the next line beneath, bringing it close beside the street number in the adjoining column to the left.

Attention is called to the fact that the Los Angeles company writes the *name* in pencil, so that it may be easily erased and a new one substituted when necessary. In the following columns to the right there are twenty-one printed headings corresponding to some of the most general classes of service upon which specific charges are made, and three others are left blank for special headings. Upon the opposite page, as shown, there are three groups of columns, which are exactly alike and which answer for the entry of three years' record.

The patron's name and the description of service having been placed upon the first page, the charge is at the proper time entered up in the column headed "quarterly

rate." When the bill is paid, if there is an allowance or supplemental charge, it is entered in the column designated, together with date of payment and amount, with the folio of the cash book from which entry is carried. If the account becomes delinquent and a special record of such accounts is kept, it is carried to the delinquent register and the folio entered. The rated water register when open measures 17x34 inches. Every fourth line is dark blue, easily distinguishing the accounts from one another. Upon a double page there is space for three years' record for twelve patrons.

THE SPECIAL REGISTER.

Where there is found to be any considerable amount of special or transient business with contractors or others which must be looked after at irregular intervals, and which it is customary to handle through journal and ledger entries, it will be found a great convenience to have a separate register for this class of patrons exclusively, which should follow the same general lines that the metered and rated water registers follow. Into this should be thrown all classes of service not strictly belonging to either of the other two registers. It becomes thus a petty sales book and obviates the necessity of encumbering the general ledger with many small accounts and is, in proportion to the amount of business it carries, as much a necessity as either of the consumers' ledgers. An illustration of a convenient form of register for this class of service is given. The description of the service is entered under "Remarks." A column heading is provided for application number, another for date, another for the entry of cash-folio when account is paid, and others are given for amount, addition, reduction, date paid and amount paid. It is intended that one line only be given to each entry, and that they follow one another in the order in which the service is rendered. Footings of the column "amount paid" are at stated times carried through the journal to the general ledger as a debit to the "special consumers" and a credit to the "special water" account, the complementary entries reaching the general ledger through the footings of the "special consumers'" column in the cash-book in the same way that the "metered" and "rated" water cash receipts are handled.

The cash-book will be taken up in the June number of MUNICIPAL ENGINEERING.

THE LOS ANGELES METHOD OF TREATING ACCOUNTS.

The following description of the method of treating accounts by the Los Angeles City Water Co., will be found of interest:

Our works are owned by a private corporation, under a contract and lease from the municipality, and under the provisions of the present law of the state, our rates are made annually by the city council.

Our plant consist of a main supply, brought into the city by a forty-four-inch conduit by gravity. About two-thirds of the supply is also delivered by gravity from two reservoirs, one having a capacity of 18,000,000, and the other of 40,000,000 gallons. The balance of the supply is pumped from one of the above reservoirs, into three others, for the supply of the higher portions of the city. The large area (six miles square) of the city requires a great length of distributing mains, and a more costly plant than more compactly built cities of equal population.

We have about 17,000 active services, and collect bills monthly, requiring the services of eight collectors. We have, for the last two years, put in an average of about one hundred and fifty services per month.

The office methods are as follows:

When application is made for a service tap, the applicant signs a contract containing the general rules and regulations of the company. He takes a receipt (of which we retain the stub) for the amount

RATED WATER

American Water Works Standard Bookkeeping System.—Copyrighted by Municipal Engineering Co., Indianapolis.—Patent Nos. 78,356-58,710

Line No.	Serv. No.	Street No.	Name and Street	Family Fee	House Rooms	Hotel	Store	Office	Saloon	Tenement House	Water Closet	Bath Tub	Urinal	Sprinkling, Lawn	Sprinkling, Park	Horses	Cattle and Mules	Cows	Livery Stable	Bank	Railroad Eart.	Dying Stores	Motors	Special				Date On	Date Off	Season Rate	Annual Rate	Line No.	
1																																1	
2																																2	
3																																3	
4																																4	

Rated Water Register (first page), of The American Water-Works Standard Bookkeeping System, size of book when open, 17x34 inches.

REGISTER.

189 Quarter	Quarterly Rate	Addition	Reduction	When Paid	Amount Paid	Cash Folio	Del'y Reg'r	Remarks	189 Quarter	Quarterly Rate	Addition	Reduction	When Paid	Amount Paid	Cash Folio	Del'y Reg'r	Remarks	189 Quarter	Quarterly Rate	Addition	Reduction	When Paid	Amount Paid	Cash Folio	Del'y Reg'r	Remarks	Line No.
First									First									First									1
Second									Second									Second									2
Third									Third									Third									3
Fourth									Fourth									Fourth									4

Rated Water Register (second page).

SPECIAL REGISTER.

American Water Works Standard Bookkeeping System.—Copyrighted by Municipal Engineering Co., Indianapolis.—Patent Nos. 78,356-58,710

App. No.	Date	Cash Folio	Del'y Record No.		Name	Amount	Addition	Reduction	Total	Amount Paid	When Paid	Remarks

Special Register of The American Water-Works Standard Bookkeeping System, size of page 17 inches long by 14 inches wide; open book, 17x28 inches.

paid for tapping, and an order is entered on another book, to the superintendent, to put in the tap. A record is returned by the tapper showing the location of the stop-cock, measured from the nearest street corner, and from the property line.

Our taps are put in with a driven corporation cock, and a lead and iron union, and a stop-cock placed just inside of the curb lines, making two places, at either of which the water can be turned on or off.

The taps are entered in a series of books marked "service records," which show the numbers of the services consecutively, from one upward, and the date upon which the same were put in. This makes a record from which we can locate every service cock in the city. We also keep a duplicate copy of the same, arranged by streets instead of consecutive numbers, for still greater convenience of reference.

We have a pipe map, made on a scale of three hundred feet to the inch, which shows all the water mains, with their size, the location of gates, and fire hydrants.

Our gate book, is a record of the size and location of all gates in the system.

For the purpose of making bills, we keep a rate book, by streets, showing the number of service, name of owner or tenant, house number, and rate per month. These rates are made from data furnished to the office by an inspector, whose special duty it is to furnish a card from personal inspection.

On the "rate books" and "consumers' registers" the names of owner and tenant are entered in pencil, on account of frequent changes.

The bills are given to the collectors, each of whom has a special part of the city for his route, the office charging him every morning with the amount of the bills given to him for each day, and his statement is made by a return of his collections, rebates and unpaid bills. He balances his work at the close of each day.

His collection books consists of one for alternate days, so that his book for one day's collection is left in the office the following day, and checked upon the consumers' register.

The consumers' registers are made as a copy of the rate-book, as far as the number of the service, house and name of street is concerned, but have an extension on the open page, showing columns for the entries of twelve months; in which are shown the date of payment, amount of bills, rebates, if any, and unpaid bills, carried over.

At the end of each month the several columns are footed up, after noting that every bill is accounted for, and as you will see, the amount of collections and rebates, and "carry overs," or unpaid bill, should exactly balance the amount of bills issued. The total collections must also correspond with the amount on our ledger for the month, taken from the daily receipt books.

(NOTE.—In a smaller concern, the "rate-book" might be dispensed with, and the bill made from the "consumers' register," but with us, both rate-book and register are in constant use, and both are necessary.)

At the end of each day, the collections are entered in the daily cash-book, and this journalized and put in the ledger, together with the collections made for service taps, and for water used for building permits, and such other purposes as we collect for, including the occasional sale of old material, etc.

The amount for water rates, permits, services, and for old material sold, must correspond with the returns of the several collectors, and any discrepancy is easily traced at the end of the month when the final balances are made.

The amounts of the collections of each day are deposited with the treasurer, taking his voucher for the same.

The accounts of monthly collections from all sources are thus rendered in gross from the books of the collection office, to the office of the secretary of the company, who keeps the other books of the corporation, such as stock and dividend accounts, etc.

He keeps an account on his books of the gross amount of the receipts as shown in the monthly report for water rates, material sold and service taps.

Against these credits, he charges, *general expense account* for labor, material and salaries, and *construction account* for labor and material used in adding to the plant. There is also, of course, a dividend account. His bookkeeping is concentrated in small compass, all details being kept on the books before mentioned, by the collection department.

THE OUTLOOK FOR PUBLIC WORK.

Early in April inquiries were sent by MUNICIPAL ENGINEERING to the city engineers of all towns in the United States of more than 5,000 population, asking for the most accurate information that could be furnished regarding contemplated work to be done during 1897. The replies give a pretty fair indication of the outlook for work in the smaller cities, in the construction of pavements and sewers. The information from about forty cities shows that work has already been determined on amounting to about $2,000,000 for paving and

$600,000 for sewers, besides expenditures in the extension of water mains, the construction of bridges and much other kindred work. This is but an indication, as the places from which these reports come represent but a small proportion of the field where the greatest amount of public work has been in progress in the last few years. There are a number of cities, not included in these estimates, each of which spend nearly this amount annually, and it is well near impossible to approximately anticipate the work that will be done by them. Many of the smaller cities also report that information can not be given at this time, as to the work which will be ordered by them. The news in our improvement and contracting department shows more work than is usually chronicled at this season. The more definite information received up to the time of going to press is set forth in the following table:

Cities.	Paving.				Sewers.				Water Mains.		Bridges.	
	Kind.	Foundation.	Sq. Yards.	Total Cost.	Kind.	Size.	Lin. Ft.	Total Cost.	Lin. feet.	Total cost.	No.	Cost.
Albany, N. Y.	Asph. block. / Brick	Sand / 6-in. concrete	4,590 / 50,000	$16,500 / 100,000	Brick. / Pipe	4 ft. circ / 12 to 24-in.	1,200 / 5,000	$4,855 / 13,000			1	$35,000
Amsterdam, N. Y.	Macadam		3 miles.		Pipe	18-in.	4,000					
Asheville, N. C.					Pipe	6, 8, 10-in.	3,500	1,300				
Auburn, N. Y.	Asphalt	Concrete	18,000	36,000					2,700			
Brooklyn, N. Y.	Asphalt / Macadam / Granite	Concrete / / Sand / Concrete	268,000 / 15,000 / 40,000 / 17,000	545,000 / 15,000 / 70,000 / 47,000								
Buffalo, N. Y.	Asphalt / Brick / Macadam	Concrete	154,140 / 3,715 / 4,546	378,530 / 8,700 / 37,100	Brick		45,969	137,542				
Camden, N. J.	Stone block			20,000	Brick			15,000		$5,000		
Cedar Rapids, Ia.	Brick	6-in. Mac			Pipe		2,000					
Cheyenne, Wyo.									2,200	3,500		
Columbus, Ohio	Asphalt / Brick	Resurface	8,000 / 3,500	10,000 / 50,000								
Easton, Pa.	Brick	6-in. concrete	9,700		Pipe	30 in.	1,000					
Elmira, N. Y.	Asphalt	Concrete	6,690		Pipe	18-in.	760				1	
Fitchburg, Mass.	Macadam	Gravel	8,000	6,000	Pipe	10x12-in.	5,000					
Grand Rapids, Mich.	Gravel / Wood	/ Concrete	2,400 / 4,500	3,000 / 8,000	Pipe	8x15-in.	5,000					
Hornellsville, N. Y.	Brick / Macadam	Concrete	9,000 / 2,200	18,000 / 2,400								
Ironton, Ohio					Brick	27x33-in.	2,010	6,000				
Jackson, Mich.	Brick	Concrete	83,000	61,000	Brick	30x66 in.	2,600	8,600	8,300	4,400		
Jackson, Tenn.					Pipe / Pipe	12x15-in. / 6x12-in.	4,000 / 6,000	3,000				
Joliet, Ill.	Brick		30,800	43,355								
Keokuk, Iowa.					Brick		1,950	5,740				
Lafayette, Ind.	Brick / Macadam	Concrete / Stone	1,333 / 5,333									
Lima, Ohio.	Asphalt / Brick	Concrete / Concrete	30,000 / 20,000	70,000 / 35,000	Pipe		10,000					
Logansport, Ind.	Brick	Stone	43,296									
Medford, Mass.					Pipe	6x15-in.	10,000	20,000	8,000	8,000		
Meridian, Miss.	Brick / Chert	6-in. concrete / 6-in. slag	15,000 / 25,000	30,000 / 30,000								
Newcastle, Pa.	Brick	Concrete	25,000		Pipe	Various	5,000					
Newport, Ky.	Brick / Macadam	Concrete / Concrete	6,000 / 1,200	16,000 / 2,500	Brick	700relining	old	trunk s	ewer.			
Passaic, N. J.	Macadam		5,400	4,000								
Pittsfield, Mass.	Macadam			7,000								
Philadelphia, Pa.					Vari'us			250,000			1	400,000
Port Huron, Mich.	Brick / Wood	Concrete	6,000 / 10,000		Pipe	8x12-in.	10,000					
Quincy, Ill.	Brick	Stone	48,254	69,120	Brick / Pipe	2x5 ft. / 8x15-in.	3,750 / 921	16,940 / 1,296				
Racine, Wis.	Brick	Concrete	30,000	45,000	Brick	32x24-in.	3,100	6,500				
Raleigh, N. C.	Macadam		7,560									
Richmond, Ind.	Brick / Gravel	Concrete	3,600	8,000 / 11,000	Pipe	9x12-in.	1,200	900				
Rockford, Ill.	Brick	Rubble	17,093						3,400			
Rome, N. Y.					Brick / Pipe	30x36-in. / 6x24-in.	4,000 / 35,000				1	8,000
San Jose, Cal.	Bitumen		8 blks.		Brick / Brick	66-in. / 25x87¼	25,000 / 13,000					
Sioux City, Ia.	Asphalt / Brick	Concrete / Concrete	21,000 / 50,000	50,000 / 80,000	Pipe	15x18-in.	1,600	2,000	500	1,200		
South Bend, Ind.	Brick	Gravel	82,000	82,000	Brick / Pipe	36x81-in. / 15x24-in.	5,900 / 5,800	19,000 / 8,000				
St. Louis, Mo.					Brick			91,552				
Taunton Mass.	To be ordered.			35,000								
Waterbury, N. Y.					Pipe	10x12-in.	1,500				1	
York, Pa.	Brick	Concrete	40,000	116,000								

Below we give explanatory notes which could not be included in the above table and responses from cities able to furnish only general information at this time:

Bay City, Mich. (Geo. Turner, C. E.). Nothing ordered by common council; too early in the season; will report as soon as anything is contemplated.

Birmingham, Ala. (Julian Kendrick, C. E.). No ordinances as yet have been passed.

Bloomington, Ill. (W. P. Butler, C. E.). No accurate information can be furnished at this time. Some brick paving will probably be done during the summer. Some sewers will be built, but no accurate information now.

Burlington, Ia. (S. Dwight Eaton, C. E.). Our city will probably expend $50,000 in 1897 in grading, paving with brick and some macadam; sewerage with stone, also of pipe and some water mains. The amount of work in each department is undecided.

Columbus, Ga. (R. L. Johnson, Supt. public works). So far as at present known, this city contemplates no work of importance. We have only a small amount of paved streets, and nothing will be done except to keep the present streets and sewers in repair.

Dayton, Ohio (F. M. Turner, C. E.). There is nothing of any importance contemplated for this season.

East Liverpool, Ohio (Jno. A. George, C. E.). New council have not taken their seats yet. Can not tell what will be done until after that event. Will try and remember you later.

Kansas City, Mo. (Henry A. Wise, C. E.). There will be several sewers built and streets paved in Kansas City during the year 1897. All paving is started by petition, so can not give an approximate estimate at present.

Hastings, Neb. (C. A. Heartwell, C. E.). There is no new work being done in this city as yet.

Macon, Ga. (J. W. Wilcox, C. E.). Four miles of streets will be paved and some other work may be done, but it is too soon to give information.

Marinette, Wis. (A. L. Hillis). Probably no work will be done here this season; later in the season a few lateral sewers may be built.

Marlboro, Mass. (Jas. F. Bigelow, C. E.). I think the season will be very quiet at this place. We are not contemplating any work of any amount at present.

Mobile, Ala. (D. M. Ross, C.E.). A change in administration and the reorganization will delay work for the present. The city engineer has got no instruction to go on with street improvements.

Minneapolis, Minn. (F. W. Cappelen, C. E.). Can not give the desired information yet, as only a little work has been ordered so far.

Nashua, N. H. (W. H. Balch.). There will be very little work done here this year, as the amount appropriated for that purpose is small.

Nashville, Tenn. (J. A. Jowett, C. E.). Most of our spring work is now under contract. The most important work in prospect just now is the construction of about 800 feet of brick culvert for filter work, about six feet in diameter. This may be let in May or June.

Oil City, Pa. (A. T. Hyde, C. E.). Laws as construed by court are practically prohibitive of sewer work.

Oshkosh, Wis. (Geo. H. Randall, C. E.). A very little work will be done.

Pueblo, Colo. (E. W. Hathaway, C. E.). A little too early for the information you desire.

Quincy, Mass. (C. F. Knowlton, Com. Pub. Works.). No special work yet ordered by the council.

Rock Island, Ill. (W. A. Darling, C. E.). There will probably be some brick paving with macadam foundation and some water mains laid, but none have been provided for as yet by the city council.

Seattle, Wash. (R. H. Thomson, C. E.). The attention of this city is given largely to preparing to prosecute Cedar river gravity supply system.

Shamokin, Pa. (F.W.V. Lorenz, Borough Engineer). Brick paving not yet decided; likely on Sunbury street. Pipe sewers will be laid where required, sizes to be decided by the council.

Springfield, Ill. (C. M. Rickard, C. E.). No work of any description has been laid out here yet for this season, and from present indications but little will be done.

Stamford, Conn. (W. B. Cochrane, C. E.). Some paving and sewer work will be done this year, but how much can not be determined until after May 1, when the new board comes in.

Trenton, N. J. (C. C. Haven, C. E.). No information can be furnished at present.

Freeport, Ill. (Arthur Lagron). No work contemplated, as we are just having an election and a new council is starting in.

Sedalia, Mo. (R. Morey, C. E.) No new work has been determined on.

San Jose, Cal. (C. M. Barker, C. E.). The city has just passed resolutions to improve about seventy blocks in this city with macadam, about the same number with gravel and about eight blocks with concrete and bitumen. A contract has recently been let for 5,400 feet of brick sewer five feet diameter, cost a little over $25,000; a contract will be let in a short time for 3,060 feet egg-shape sewer 25 in. x 37¼ in., to cost about $13,000; a contract was recently let for 1,600 feet of eighteen-inch pipe sewer, cost about $3.50 per foot.

The following cities report that

no work is now contemplated this season.

Columbia, S. C.	Millville, N. J.	Haverhill, Mass.	Shenandoah, Pa.
Cumberland, Md.	New Albany, Ind.	Lansing, Mich.	Sioux Falls, S. D.
Fort Smith, Ark.	Paterson, N. J.	Leavenworth, Kan.	Stillwater, Minn.
Harrisburg, Pa.	Petersburg, Va.	Lynn, Mass.	Streator, Ill.
		Manistee, Mich	St. Joseph, Mo.
		Michigan City, Ind.	Waco, Tex.

THE QUESTION DEPARTMENT.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

QUANTITY OF ASPHALT IN BERLIN.

What is the quantity of asphalt pavement in Berlin, Germany, and when was it laid?

A. A., Dept. Public Works, N. Y. City.

To Date.	*Past Year, Sq. Yds.*	*Total Sq. Yds.*
1873	3,067	3,067
1878	25,236	28,303
1879	47,354	75,657
1880	51,386	127,043
1881	22,498	149,541
1883	74,915	224,456
1884	78,873	303,289
1885	81,873	385,152
1886	44,691	429,843
1887	63,462	493,305
1888	90,333	583,638
1889	102,856	686,494
1890	98,072	784,566
1891	137,651	922,217
1892	113,959	1,036,176
1893	116,192	1,152,368
1894	128,428	1,280,796
1895	130,580	1,411,376
1896	111,148	1,522,524

It is interesting to note that the population of Berlin in 1873 was about 800,000, and in 1896, 1,800,000. The fiscal year in Berlin ends April 1, and the amounts given are those up to April 1 of each year.

VALUE OF PROPERTY INCREASED BY PAVEMENTS.

Is property enhanced in value when street pavements are laid near it? Are rentals improved? *F. I. M., Pueblo, Colo.*

The moment such a city as yours enjoys its first pavement, the property of the streets paved will increase in value often many times the expense of the pavement, and experience for twenty years in the east and west has shown that well paved streets make it easy to rent property upon them, and at increased rates over property upon streets without pavements. Well laid and well maintained street pavements are a source of comfort, cleanliness and increased prosperity for all cities, especially growing ones.

METHOD OF REPAIRING ASPHALT PAVEMENTS AT WASHINGTON D. C.

What is the system of repairs to asphalt pavements and how ordered in Washington? How long are the pavements guaranteed? How long are the repairs guaranteed? *Ernest Adam, Newark, N. J.*

Everything is done by contract and under the direction of the engineer commissioner. New pavements and the renewal of the entire surface of very old ones are guaranteed for five years.

The renewal of pavements made necessary by tapping water, sewer or other pipes, also all patching and work necessary to keep old pavements in repair, which do not need *entire* renewal or resurfacing, and upon which the five-year guarantees have expired, are done by contracts made every five years. The contractor is bound to do the work ordered by the engineer commissioner from time to time, as the government inspectors shall have reported necessary. It is always done with an inspector in charge. Only such portions are cut out and repaired or replaced as the inspector directs. The work is paid for

by the square yard where possible and of a uniform thickness, otherwise by the cubic yard of material used. The prices are those at which the contractor has agreed to do any work of the several kinds ordered during the five years of the general repair contract. Such repairs and patching are carefully recorded and guaranteed for one year.

New pavements are laid from appropriations for that purpose, and old pavements are maintained from money for that purpose. These separate accounts, kept for many years, enable Washington to compare the true cost of many kinds of pavements; which is interest on the first investment plus the annual cost of maintenance for each kind of pavement per square yard.

A SALT LAKE PAVEMENT.

What was the material laid during 1896, on South Second street, Salt Lake City, Utah, and is it a success?
H., Salt Lake City, Utah.

It was an asphaltic sandstone containing about thirteen per cent. of bitumen, the balance being principally fine silicate sand, some limestone, and a few other mineral substances of little importance. Sufficient time has not yet elapsed to know whether it will succeed or not.

GAS IN PARIS; ITS PRICE AND CITY REVENUE.

Does Paris own the gas plants there? What is the price of gas and what does the city receive? *New York Legislator.*

The city does not own any of the plants. There are six combined companies, but controlled by a rigid agreement or concession from the city. The price of gas to private consumers is 30 centimes per cubic meter ($1.69 per thousand cubic feet), and to the city 15 centimes per cubic meter (85 cents per cubic foot). The conditions of the present agreement of the combined six companies are:

First. Their capital can not be increased above $16,800,000, nor bonds be issued.

Second. The franchise for fifty years ends in 1905.

Third. A fixed tax of $40,000 per year is paid to the city.

Fourth. Two centimes per cubic meter (11⅓ cents per thousand cubic feet) is paid to the city for all gas made.

Fifth. The companies are allowed to pay a dividend of 10 per cent. upon their capital. and then must give to the city one-half of the profit over and above 10 per cent.

Sixth. Pipes of a size dictated by the city officials must be laid whereever the city officials order, also removed, replaced or transferred from one portion of a street to another as the city authorities may decide is best for the public welfare.

Seventh. At the expiration of the franchise all subways, piping and rights of the charters of the six combined companies become the property of the city.

It is interesting to note that in 1880 the income of the city from the gas was about $3,000,000 per year. In 1890 the income was $4,000,000 per year, and at present a little more than this, but not so much as would be supposed, because of the increasing use of electricity. The city reserves the right for every means of illumination to be introduced as it may deem best for the citizens of Paris, provided it is superior to former means of lighting. The French theory is that whatever improves the public comfort, improves public health and welfare, and the city reserves the right to permit such improve-

ments without paying damages to inferior things interfered with. This applies not only to the health department, but to the public lighting and many other branches of the municipal service.

American cities should always limit the time of all franchises and compel companies to pay liberally and constantly for all franchises.

PRICES OF PAVEMENTS VARY WITH DIFFERENT CITIES.

Please give the cost price of sheet asphalt, block asphalt and brick pavements per square yard; also cost of paving material, cost of sand, cost of different fillers, cost of concrete, both gravel and sand.
Wm. B. Boaz, Hamilton, Ohio.

It is not possible to answer these questions, except for a given city and street at a stated season and year. The question is published as an example of one of the many complex demands made upon the editor of this department of the MUNICIPAL ENGINEERING magazine. Freight, the price of the many materials used, the quantity of each needed, the cost of labor of different kinds, the amount of capital involved in connection with one or more of the pavements mentioned, the amount of pavement, the traffic, the season of the year, and many other elements enter into the problem.

The true answer is that the question of costs is a local matter. The public and city officials are too often led astray by learning of the cost of different pavements in other localities and comparing them with their home prices. At present there is bitter competition between many companies using the same materials and between different materials, resulting in pavements at less than cost, to the final injury of the city obtaining them, unless the work is done under constant and careful supervision. Contractors bidding below cost are constantly trying to force work upon cities which just passes inspection.

The above question, therefore, serves a very useful purpose, as a warning not to purchase cheap pavements which in the end will prove very expensive to the city obtaining them, for it must be remembered that all pavements require maintenance and repairs, poor ones more than good ones.

ASPHALT PAVING ON BRIDGES IN CALIFORNIA.

I have heard of several bridges in California being paved with asphalt. What is used, and is it successful there or elsewhere? *X, Boston, Mass.*

After some correspondence MUNICIPAL ENGINEERING MAGAZINE is able to state that six bridges in California have been reported as paved with asphalt pavement of refined asphalt, sand and limestone powder mixed and laid hot at about two inches thick on the outer edge and three inches at the center.

This is practically an asphalt pavement similar to the street pavement in eastern cities of the United States. There are many bridges in the east which are paved with asphalt, as well as scores of them in Europe. It acts not only as a waterproof covering for the structure below, but also suppresses the jarring often present when bridges have a rougher form of pavement upon them.

PENETRATION TESTS OF ASPHALT COMPOUNDS.

Are penetration tests in connection with asphalt compounds for paving very important? Upon what principles do they depend? *M. A. R., Chicago, Ill.*

They are very important, but unless made by an experienced person, inaccurate and misleading results are obtained. Tests taken by different persons vary, even with the same material under like con-

ditions. This is because of the extreme delicacy of the tests, which depend upon the amount of penetration of a needle into a bitumen or an asphaltic cement in a given time, the material tested being maintained throughout at a given temperature. If a person wishes to train himself to accurately make penetration tests he must carefully guard against variations in the size and shape of the needle, its temperature, as well as the temperature of the material tested, and the period of time selected for the test. He must take several samples of different known compositions and practice with the penetration needle until under the same conditions he can constantly repeat the work and get the same results within a reasonable degree of accuracy.

COST OF STREET CLEANING IN SEVERAL LARGE CITIES.

Please give the approximate cost of street cleaning in one or two European cities and New York.

S. G. B., New York.

The following statistics should not be used for complete comparisons between the cost of street cleaning of Paris, Berlin, Vienna and New York, the cities which are chosen with which to answer your question, because the local conditions, kind and character of pavements, and manner of disposal of sweepings, etc., are different in each place, and the kitchen garbage is often disposed of by others than the city.

Paris pays about $1,400,000 for sweeping and carting away the accumulations from about 186,000,000 square yards of surface, which includes its streets, many sidewalks, alleys and public places, etc. As many as 3,000 laborers are at times employed, both men and women, at comparatively small wages, some working all day, others all night, and others but a few hours, when extra work is needed. This does not include carting away ashes and house garbage. Population of Paris is 2,450,000.

Vienna pays about $850,000 annually for cleaning its streets, including about $40,000 for carting away ashes and house garbage. Population of Vienna is 1,365,000.

Berlin pays, including street sprinkling, about $570,000. The carting away of ashes and house refuse is done at private expense, under strict city regulations completely enforced. Berlin officials, with whom the editor of this department has talked, think that if the city removed the ashes and house refuse the sum expended would be double the present amount. This would make $1,400,000 for street cleaning and removal of ashes, etc., from a city approximately the same in population, 1,800,000, as New York, but covering a far greater area. This less expense would be due to smooth pavements and lower rates of wages.

New York pays a little less than $3,000,000 for street cleaning and removal of garbage and ashes. This amount will be less as the pavements are improved, the uneven rails replaced by flat grooved ones, and the rates of wages reduced to what is usually paid for equivalent work in private undertakings, the rates at present being, by law, from 25 per cent. to 30 per cent. above the private market rate. This is due to not only the price paid per hour, but that eight hours constitutes a day's work for a vast majority of the employes. The work, however, is well done. The population is 1,800,000.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

BOOKS ON WATER-WORKS CONSTRUCTION.

Please give list of books dealing in water-works construction.

J. W. Kay, Milford, Mass.

Among the best American books on water-works construction are Fanning's "Water Supply" ($5), Gould's "Hydraulic Formulæ" ($1.50), Billings' "Some Details in Water-Works Construction" ($2), "Water Tower and Pumping Station Designs" (Architectural) ($2). New books of use in design are Coffin's "Graphical Solution of Hydraulic Problems" ($2.50) and Herschel's "115 Experiments on Carrying Capacity of Large Riveted Metal Conduits" ($2).

CEMENT TESTS AND CHEMICAL SYMBOLS.

1. On page 144 (March number), what is the meaning of test of 7 days neat as sampled, 502 lbs., with 1 per cent. of sulphate of lime added, 810 lbs., English Portland cement, *i. e.*, how is the test made and what relation is the sulphate of lime to cement?

2. On page 147, what is the meaning of SiO_2, Al_2O_3, etc.?

Wm. B. Boaz, Hamilton, Ohio.

1. The tests referred to were intended to ascertain the effect of adding a certain proportion of sulphate of lime (gypsum) to neat cement. First, a sample of cement was taken and briquettes were made of the form described in recent numbers of this magazine, by mixing the cement with the proper proportion of water and ramming it into the mold. After the briquette had stood for seven days in water, it was put into the testing machine and broken. The briquette at the smallest section has an area of cross section of one square inch, and the application of 502 pounds of tension upon this briquette was necessary to pull it apart. Its tensile strength is therefore 502 pounds per square inch. A sample of the same cement was taken at the same time and to it was added one per cent. of the sulphate of lime. A briquette was then made of this mixture and treated in the same manner as the other briquette. This briquette had a tensile strength of 810 pounds per square inch.

2. The principal ingredients of cement are alumina, silica and lime. The chemical symbols for these substances and their compounds are the following:

CaO is lime.

$CaCO_3$ is carbonate of lime.

Al_2O_3 is alumina.

SiO_2 is silica (quartz sand).

H_2O is water.

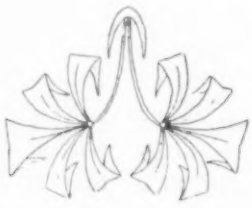
H_2OSO_3 or HSO_4 is sulphuric acid.

$Al_2O_3\ 2SiO_2+2H_2O$ is silicate of alumina or clay.

$CaSO_4+2H_2O$ is sulphate of lime or gypsum.

$CaSO_4$ is plaster of paris, obtained by burning gypsum and driving off the water.

MgO is magnesia.



The City Engineer on the Board of Public Works. The legislature of the state of Nebraska has given the city of Omaha a new charter, to give the "outs" a chance to get in in May instead of waiting until next January, and has increased the powers of the mayor materially for the sake of the prospective incumbent, but has incidentally attempted an improvement of the methods of conducting public works by consolidating the department of public works and that of city engineer, and making the latter official the chairman of the board and its executive officer. To save salaries, the other members of the board are, *ex officio*, the city controller, elected on the same ticket with the mayor for a term of three years, and the building inspector, appointed by the mayor and confirmed by the council. The presence of the city engineer, or of his representative, duly designated by the mayor in case he is incapacitated temporarily, is necessary to have a quorum of the board for the transaction of business. He has the appointment of an assistant engineer, subject to the confirmation of the council, of other assistants under ordinances of the council, fixing the list of employes, and of inspectors under the approval of the board. He takes active charge of the construction of all improvements and of the employment of all labor for street cleaning, sewer and street repairing and cleaning, sidewalk and bridge repairing and all other work. The board adopts plans and specifications and lets contracts, all subject to the approval of the council. So far the system is good, except that the *ex-officio* members may not be the right men for members of a board of public works and are more likely to be political workers than the city engineer, since they are subject to no requirements of capacity or capability, while he must be a competent civil engineer of five years' successful practice. But the inception of public work and the general character of improvements is still left in the hands of the council, and, in the case of most street improvements, in the hands of the property-owners, so that the board is still simply the servant of the council, having scarcely the right even to offer advice officially. This recognition of the engineer is gratifying, and the improvements made are a material advance. It is reputed that it is due to the assistance of an engineer in the preparation of the charter.

Maps as City Records. The receipt of some maps of Altoona, Pa., from Mr. Harvey Linton, city engineer, on a scale of 300 feet to the inch, suggests some discussion of the use of such maps as city records, since one of these maps is a record of the location of water hydrants, one is a record of the location and size of lines of sewer, and a third is a blank map (blue print) with the streets white, to permit the insertion of any record desired. Leaving out of account the records of street and lot lines, monuments, and other

strictly survey records, some such method as the one suggested by these maps is a most convenient way of keeping records. It is seldom that a city office can not secure money enough to obtain a lithograph on a reasonably large scale, showing the street lines and street names, and each year in the annual report, one or more maps can be published, showing each a single system of records: thus one will show the lines of sewers, giving sizes and gradients or capacities; one the lines of water pipe with sizes and locations of hydrants, valves and other appurtenances; one the car lines and ward boundaries; one the street pavements, giving material and date of construction; one the location of electric, gas and oil lamps; one the permanent sidewalks. Unless the city is growing rapidly, it is not necessary to revise and publish these maps yearly, but one or more can be put in each annual report. As a basis for such report maps and to give fuller details, tracings or blue prints of the large scale maps usually found among city records should be kept on file, and all changes in and additions to each system of improvements should be entered when made. A separate map for each kind of improvement will prevent confusion and promote clearness and ease of reference. The maps can be mounted as wall maps if the scale is not too large, or filed in sections. The larger the scale the more accurately the information can be conveyed and the larger the amount of detail possible. House numbers can be shown on the large scale maps of 50 to 100 feet to the inch. If blue prints are used for the basal map, the information can be put on in white by means of the ordinary soda solution, or in red by dissolving the soda in red ink. Scaling should not be depended upon for the location of underground marks or structures, but the distances from known points or lines should be entered on the map or on an accompanying index.

Erie Water-works. The report of the water commissioners of the city of Erie, Pa., for 1896, contains a short history of the construction of the present works in 1867 to 1874, and full statement of the details of operation of the works during the past year. An interesting comparison may be drawn between the cost of water as supplied by the city and by a company. In 1867 a contract was entered into between the city and a water and gas company, by the terms of which the city would pay $9,000 a year for fifty hydrants. There are now over five hundred hydrants in place, and the city would pay under the contract, nearly $90,000 a year for fire protection and other purposes. Rates to private consumers were also much higher under this contract than they are at present. Fortunately the contract provided that if the city began the construction of works within a year this contract should be void, the company being reimbursed for any expendi-

tures. The company did not begin construction and the city decided to construct the works. The account with the city for 1896 shows that the city was charged $28,270 for hydrants and $2,808.78 for parks, flushing sewers, drinking fountains and public buildings, part of which is offset by rental of offices in city building amounting to $1,500. The city paid the interest on the bonded indebtedness, amounting to $27,043.62. The difference between the amounts charged to the city and the amount of interest paid and rent charged is $2,784.97, which amount is charged off against the original cost of the works. The cost of construction has been about $1,500,000, and the amount not yet charged off is $673,305.55, indicating that the works have paid more than one-half the cost of construction, in addition to the maintenance and operation expenses, the small charges to the city for public uses being more than enough to pay the interest on the bonded debt. The table of water rates indicates that consumers pay reasonably low rates and meter rates were reduced three years ago from a graded rate of six to ten cents to a level rate of six cents, with a consequent diminution of receipts of $5,000 a year. Throughout the report the facts show the material advantage to both city and consumers of municipal ownership, and the historical sketch shows the improvement in design of the works constructed over the plans proposed by the company.

New Bridge Over the Niagara.

The old single-track suspension bridge carrying the Grand Trunk and other railways across the gorge below Niagara Falls was built by John A. Roebling in 1855, and with some modifications, from time to time, has proved sufficient for traffic for over forty years. The increase in weight of locomotives and trains, and the demands of traffic, have finally forced the construction of a new double-track bridge, which will have also the roadway and sidewalks of the present bridge and tracks for electric cars. The new bridge is constructed upon an entirely different plan, being a braced steel arch of 550 feet span, with a truss at each end 115 feet in length. The springing points of the arch are on stone piers far down the cliff, and the roadways are carried on braces rising from the arch to the horizontal girders on the levels of the present driveway and railroad tracks. Since no false work can be put in to carry the weight of the arch during construction, the bridge must be constructed in the cantilever style. For this purpose the structures directly over the piers and between the piers and the cliff were constructed first, and the upper chord was securely anchored back into the solid rock, 250 feet from the edge of the cliff. The arch could then be constructed by adding piece after piece, each member being handled by a traveling crane moving on the top of the completed portion of the structure, and riveted securely in place. The work progresses at the same rate from both

ends, so that the two halves will meet at the center. The whole arch is built a little higher than it will finally stand, so that when the two ends meet they will be slightly too high to be joined. Adjustment is provided so that the ends of the two halves of the arch can be gradually lowered by slacking the ties to the temporary anchorage mentioned, so that they can be brought exactly together and the junction made. The use of the track on the old bridge has not been interfered with, although the new bridge occupies the same place. It is expected that the new bridge will be completed July 1, and the old bridge will then be removed. The bridge is alongside the cantilever bridge of the Michigan Central Railroad and will be a more pleasing object in the landscape.

Specifications for a Gravel Road. In the report of the New Jersey commissioner of public roads for 1896, Mr. J. J. Albertson gives specifications for a gravel road. The roadway is cleared 50 feet wide, graded 30 feet wide and an excavation 14 feet wide is made to receive a layer of gravel 6 to 8 inches thick, which will conform to the surface of the earth as graded on each side. The slope from crown or center of road to sides (15 feet each side of center line) is one inch fall to each foot. Price is bid for clearing and grubbing sidewalks, per acre preparation of road-bed, per lineal foot of road; for excavation more than 12 inches deep, per cubic yard for the excess. When draining is necessary it must be done with 4-inch tile laid on a yellow pine board, one inch by six inches at a depth of 2.5 feet below the finished surface, and the joints covered with meadow hay, for a price per lineal foot of drain. The gravel to be used is to be selected by the road committee and the engineer, and any objectionable material on top of the bed of gravel must be removed by the contractor at a price per cubic yard named in his bid. The gravel is put on in one layer and when compacted must be 8 inches deep in the center, and 6 inches deep seven feet from the center. The contractor is paid per cubic yard of compacted gravel furnished, laid and rolled, complete, with an additional price per square yard for each inch of additional depth and per cubic yard per half mile for gravel carried more than one-half mile. Where open ditches are necessary along the roadside they are excavated on order at the bidder's price per cubic yard. The points worthy of specially favorable comment are the thorough rolling of the gravel which is required, the sub-soil drainage indicated and the gutters provided for to carry off the water.

Provision is not made in the specifications for the construction of bridges, culverts and other drainage structures across or along the surface of the road, these being specifically excepted. Excepting for the larger openings, where bridges are required, this kind of construction can be made more economically

under the same contract as the grading and graveling.

Books on Road and Street Construction.

A paper on highway literature, by C. Frank Allen, in the last journal of the Massachusetts Highway Association, shows the dearth of books on road and street construction in the English language, and especially American books. The old books, Gillespie's "Roads and Railroads" and Gilmore's "Roads, Streets and Pavements" are scarcely superseded by the new ones, Byrne's "Road Engineering," Spalding's "Roads and Pavements," Rockwell's "Roads and Pavements in France," Stone's "New Roads and Road Laws" and Love's "Pavements and Roads," Herschel's "Science of Road Making" and North's "Construction and Maintenance of Roads," bound in one. None of these are entirely satisfactory in all respect, but an excellent basis for practical work can be obtained by absorbing the contents of several of them.

For detailed work on the various branches of the subject there are no American books, though there are some pamphlets and many articles in periodicals and society proceedings. Judson's "City Roads and Pavements" is, in part, an exception to this statement. Among English books are Deacon's "Street Carriage-way Pavements on Stone," Stayton's "Wood Pavement in the Metropolis." MUNICIPAL ENGINEERING is the best source of information at present available. In referring to it Mr. Allen says, "The impetus of the movement in favor of improved highways has obtained such strength that, in addition to the books that have been published upon the subject, there are many periodicals which give very close attention to this subject, and perhaps foremost among these should be mentioned MUNICIPAL ENGINEERING."

Pavements and Underground Improvements.

The questions of sewerage, water supply and paving are frequently very closely related in the smaller cities. The water pipes, especially if put in by a company, may be small, to serve the small population at time of construction and are inadequate when the city grows to the period of consideration of pavements. The question of paving the main streets frequently arises before sewerage has been considered. A few cities have begun with the paving first and are ready with their warnings of the unnecessary expense and the practical impossibility of replacing pavements in as good condition as they were before the trenches for water or sewers were dug. A complication arises when the water-works are owned by a company and are inadequate and, under the contract or franchise, the city can not require the relaying of the water pipe before the construction of the pavement. Unless the water company has the city entirely at its mercy, under the terms of the contract, the matter can sometimes be remedied in an indirect manner.

Thus, in some cases, an ordinance can be passed requiring a permit and a fee large enough to fully cover the complete renewal of all the pavement likely to be injured at any time, and the repair of that pavement for its estimated length of life if unimpaired by trenches. In some other cases the company can be notified that no further enlargement of the mains will be permitted after a given date, and that any future increase in supply for the locality must be furnished through new pipes laid where the pavement will not be disturbed. Frequently a close reading of the contract, the city charter, laws and ordinances, will show that the city can readily require the work necessary, and a delay in paying the city's bills will bring the decision the city wishes. Other devices will suggest themselves on careful consideration of the special circumstances, of the particular case.

It is often suggested that it will be possible to lay the pavements first if the water pipes and sewers are laid in the alleys, which are an important feature in the plan of all western cities. There are two serious difficulties in the way of a general adoption of this suggestion. The plan of the alleys is never as uniform as the plan of the streets, and the public square frequently can not be crossed by the sewers, so that it is absolutely essential that some of the sewers be laid in the streets. The paved streets must also be crossed by the sewer lines at frequent intervals and but little of the pavement is left undisturbed.

Very frequently it is necessary to take the street water into the sewers for the section in the business part of town, and unless the streets are level, this water must be taken into the sewers at the street corners, so that in the very streets that must be paved, it is necessary to lay the sewers to drain those streets. This applies whether the separate or the combined system of sewerage is adopted. In the case of the system of water distribution it will also be found that the best location for hydrants is at or near the street corners, so that again the pavements must be torn up for placing or enlarging of mains.

On residence streets the sewers and water pipes can frequently be laid in the alleys, or, if the pavements are narrowed, as they should be, to thirty feet or less, they can be laid in the lawns, in which case it is possible to touch the pavements only at the intersections of cross streets. This is only possible in the case of sewers if a line of sewer is laid on each side of the street, but with water connections an iron pipe can be driven through under the pavement, and the lead pipe be run through this, so that no cross lines for connections are necessary.

The cry that the sewers and water pipes must be laid first is sometimes raised to defeat the improvement of the street, when a careful consideration of the case would show the entire possibility of

proceeding with the pavement first. Frequently, if a careful study of the details of the case can be made by a competent and honest expert who is not biased by local connections the most satisfactory plan will be that developed by him.

Engineers' Societies. The numerous engineering clubs and societies which are now forming indicate a growing interest of engineers in each other and in their profession. The tendency in the past among engineers has been too much towards isolation and the advancement of the individual, with too little attention to the cultivation of professional brotherhood, and the improvement in standing of engineers among the learned professions. The result of this practice is seen in the generally low estimation in which engineers have been held, with the possible exception in some quarters of a few of the most eminent, which is evidenced in the low compensation nearly all engineers receive, and the lack of recognition of their abilities and possible usefulness in many lines, even in their special field. The combination of engineers in local societies will bring about a better acquaintance of individuals, the exchange of experience and ideas, an increase in professional spirit, and can not fail to bind the members of the club closer together. The engineering societies are usually formed on one of two lines. They may be strictly professional and the lines defining membership are closely drawn. Such societies as the American Society of Civil Engineers, Mechanical Engineers, Electrical Engineers, and Architects are the best examples of such societies. The local societies are, however, usually formed upon a broader basis and include in their membership all those practicing any branch of engineering or the constructive professions, and even those interested, but not so technically, in them. Both these classes exist for the mutual technical improvement of the members and for the advancement of the profession in the community.

In a few of the larger cities there are also social clubs whose membership is restricted to members of the technical professions, and where the main objects are the cultivation of acquaintance and *esprit du corps*. None of these have thus far added to their objects the development, formulation and protection of a professional code, which, by unifying the profession about a fixed formula, can give the strength to demand and secure the recognition which few of the individual members are able to obtain. Such codes as those in the medical and legal professions are perhaps upon a basis too narrow to be satisfactory to the engineering professions, but the unity of purpose attained in those professions and the strength which that unity makes possible are much needed in the engineering profession. All these engineering societies are means towards the development of the idea of profes-

sional unity and as such will find their highest and most valuable use, though the local and personal benefits are very appreciable and to most of the members are the only value apparent.

Water Department Rules. The city of Syracuse, New York, has recently adopted an excellent set of rules and regulations for the government of plumbers, consumers and employes, which are quite full and very clear. All work of connection with water pipes must be done under permits by licensed plumbers, and this requirement extends to all parts of the house-plumbing as well as the portion of the pipe in the street. In case the house-plumbing is completed before the request for connection is filed, the office must be notified and opportunity of inspection given. All defects must be made good before a permit is issued. The rules restricting the use of water, providing for inspection, form of application, regulation of plumbers, laying of service pipes, fixtures, meters, regulating street sprinklers and use of fire hydrants and valves, payments and abatements, are not materially different from many others, but are full and clear. Regarding the refilling of trench the rule holds both property-owner and plumber responsible for its condition, but no definition of satisfactory condition is given. When the management of the water-works is efficient, or the methods of street repair in vogue in the department of public works are good, it will be found much more satisfactory to charge the plumber for his application a sum sufficient to refill the trench, excepting the portion immediately around the pipes, and to replace the pavement and keep it in repair for a year or more, and have this work done by the city department or by contract under its supervision.

CURRENT INFORMATION.

LIABILITY FOR CUTTING INTO PAVEMENTS.

The officials of the New York Post-Graduate Medical School and Hospital, desiring to excavate under the sidewalk for a vault, applied for a permit to cut into the asphalt pavement, but the city refused to issue it without the consent of the Barber Asphalt Paving Company, who laid the pavement in front of the premises under a contract with the city to maintain it in repair for fifteen years. The company gave consent on the condition, which was agreed to, that the hospital would be responsible for the pavement, the architect being told what the price of the pavement would be. The hospital authorities paid for work done in front of property adjoining the hospital, but objected to paying for work done in front of the hospital building, upon the ground that the builder was responsible. In giving his opinion Presiding Justice Van Brunt said: "It may be true that this contract is ambiguous; but the manner in which it was construed by the parties is certainly very pertinent evidence in determining its purport. The plaintiff made its claim upon the defendant for this work and there was no objection to payment upon the ground that a price had not been agreed upon; and a liability was admitted and acknowledged for the work, which was done upon the premises adjoining the hospital property. How any liability under that

contract could exist for that portion and not obtain as to the whole of the work, it is impossible to conceive from the evidence in this case."

PROPERTY-OWNERS CANNOT VIOLATE CONTRACTS.

An opinion was rendered April 17, at Los Angeles, Cal., by Judge York, in an action to recover judgment for services in grading and curbing Forrester avenue, in which a contractor circulated a petition providing that the property-owners on the street should pay him 55 cents a lineal foot for establishing the grade and curbing the street. One property-owner who signed his name sold his property on the street, and, although he never signified his intention to withdraw from the contract, he seemed to think that selling his property released him from any obligation thereunder. When the contractor undertook to make collections for the work the owner of the frontage purchased from the man who signed the contract, did not pay, and suit was brought against the first property-owner to recover the amount. Judge York decided that the contractor did his work under the contract in accordance with its terms and the property-owner who signed the contract became liable for the payment.

CONVICT LABOR ON FLORIDA ROADS.

Convict labor was employed in macadamizing a road in Duval county, Florida. The Duval Good Roads Association advocates the use of short term convicts on such work, making the claim that they would in this way pay back some of the money expended upon them and that they would stand a better chance of being called back to an honest life than if they were made to associate with more hardened criminals in a prison.

SPECIAL ASSESSMENTS FOR PUBLIC WORK.

Judge Jones rendered judgment recently, at Waukegan, Ill., sustaining the law passed two years ago, which was intended to do away with local improvement by special taxation. The right of the council to pass such an ordinance was attacked in court, where more than thirty objections were filed in the case of paving Water street, when the assessment rolls of the commissioners were filed for confirmation and default entered. The claim was made that if the ordinance was valid the proceedings of the commissioners in spreading the assessments as by special assessments were unlawful. An appeal will be taken.

MAYOR REQUIRED TO SIGN A CONTRACT.

A ruling was made in the mandamus proceedings brought by Hanlon & Knepper against Mayor Cleland at Sioux City, Ia., to compel him to sign certain contracts made by the city council with the plaintiff, for paving, curbing and macadamizing W. Seventh street. The contest arose from the fact that McNamara & Co. bid $1.79 a square yard, and Hanlon & Knepper, $1.80, but McNamara & Co. failed to accompany their bid with a certified check; hence did not get the contract. The mayor contended that Hanlon & Knepper's bid was not the lowest on the original paving, that he could not be compelled to sign such a contract by mandamus proceedings, and several other reasons. Judge Gaynor ruled that under the questions presented it was the duty of the mayor to sign the contract.

DEEP WELLS FOR WATER SUPPLIES.

A recent canvass of a few of the smaller cities in Iowa and Illinois having wells as source of water supply, shows that the deep wells give good satisfaction, there being only one instance of a well forty feet deep not being satisfactory as to quality of water or service. Clinton, Ia., has six wells 130 feet deep costing $2.60 a foot; Boone, Ia., has two wells each about 3,000 feet deep, the last one constructed costing $6 a foot; Atlantic, Ia., has 25 wells, each 83 feet deep; Red Oak, Ia., has two large wells 28 feet deep; Belvidere, Ill., has one well 1,960 feet deep, costing $2.25 a foot; Galena, Ill., has one 1,510 feet deep; Dixon, Ill., has three, from 1,600 to 1,830 feet deep and costing $1.75 a foot; Kewanee, Ill., has three wells 1,480 feet deep, costing $2 to $3 a foot. All the deep wells are from 4 to 9 inches in diameter and report the water good and service satisfactory. For many towns in this region the wells are the only source of supply of unpolluted water and the good results and reasonable cost reported should be an encouragement to other towns to undertake the construction of works.

A CITY ENGINEER'S DAMAGE SUIT.

Suit for $15,000 has been filed against Columbus Simon and Lawrence B. West, the local managers of the Barber Asphalt Paving Company, at Louisville, Ky., by City Engineer John H. Pearson. The suit is based on a report which appeared in the Critic, stating that City Engineer Pearson allowed the Breckenridge Rock Asphalt Paving Company to put down defective material in the construction of street paving on Sixth and Kentucky streets, and that he allowed the Breckenridge Company to sub-

stitute poor material for the Vermwohle imported asphalt called for in the specifications.

ASPHALT PAVEMENTS AND FIRE VEHICLES.

A statement gained circulation in Oswego, N. Y., recently that Robert J. Blackburn, chief of the fire department, objected to asphalt on the ground that the fire horses, in leaving the engine houses, would slip and fall. When questioned regarding the statement by President D. H. McCaffery, of the Department of Public Works, Chief Blackburn said: "No, sir. I never made such a statement to any man, woman or child. On the contrary if I had my way about it I would have asphalt on every street in the city. I at one time said to a newspaper reporter that the horses would have a tendency to slip after a sleet storm if they were not shod sharp. Asphalt is considered the best street for fire apparatus to be run over. The asphalt being elastic gives and the sharp shoes of the horses gain a firm hold, while its smoothness enables the wagons and engines to run at a high rate of speed without racking them all to pieces as it does over dirt and stone roads. I have been in nearly every city in the United States and have talked with the different chief engineers about their streets and all are in favor and recommend asphalt as the best."

OMAHA TECHNICAL CLUB.

The Omaha Technical Club was organized April 8 and will meet the third Monday of each month, except July and August. The club starts with sixty-five members from the ranks of civil, mining, electrical and mechanical engineers, architects and chemists, and has elected officers for the first year as follows: President, George H. Pegram, M. Am. Soc. C. E., Chief Engineer Union Pacific Railway system; Vice-President, George F. Prince, M. Am. Soc. C. E., Chief Engineer Omaha Water Co.; Secretary, J. Harry Lawrie, architect; Treasurer, Curtis C. Turner, C. E.; Andrew Rosewater, M. Am. Soc. C. E., Director for two years; E. F. Schurig, City Electrician, Director for three years.

PAVING BRICK SPECIFICATIONS AT ST. LOUIS.

The standard vitrified brick specifications adopted by the board of public improvements at St. Louis, Mo., show many changes when compared with other methods for testing brick. The absorption, cross breaking and crushing tests are abandoned mainly for the following reasons: As to the absorption test, in the opinion of the committee, any brick which will satisfy the requirements of reasonable mechanical tests will not absorb sufficient water to prove injurious to it in service; the cross breaking and crushing tests are made purely optional and not necessarily as a proof of excellence; from the experimental work done under the direction of the committee it is not possible to show any close relationship between the qualities necessary for a good paving material and high structural strength. The rattler, upon which chief reliance is placed, will be twenty-eight inches in diameter and twenty inches in length, measured inside the chamber, and has fourteen sides; the bulk of the standard charge will be fifteen per cent. of the cubic contents of the rattling chamber; the rotary speed will be thirty revolutions per minute and 1,800 revolutions will constitue a test; the loss will be calculated in per cents. of the weight of the dry brick composing the charge. All street and alley improvements that will be done during this summer will be governed by the new specifications.

A NEW METHOD OF LAYING BRICK PAVEMENTS.

A new method of laying a pavement so as to obviate noise has been tried in Sandusky with successful results. The brick, which are set on edge, are separated by thin laths and the joints filled with tar; the tar being of a viscous nature, prevents the vibration, which in other solid pavements creates the noise; two laths are put in, one above the other; the street is then rolled, after which the upper lath is removed and the joint filled with tar and sand.

LEGAL CONTEST BETWEEN ASPHALT COMPANIES OF LOUISVILLE.

The Barber Asphalt Paving Company was granted an injunction April 12 by Judge Toney at Louisville, Ky., temporarily restraining the board of public works from awarding the Breckenridge Asphalt Company a contract for repaving with asphalt Kentucky street, between Second and Floyd. The Barber Company alleges that the Breckenridge Company did not comply with specifications in the bids which were received April 7, some of the instances of failure to comply with them being as follows: The city ordinance provides that in all bids for work of this character the bidder must include his price for each individual item of work named in the proposal, and that any bid which is not in conformity with this section shall not be entertained, and as the Breckenridge Asphalt Company failed to include in its bid the work of resetting 850

lineal feet of flag gutters, that this failure renders void the entire bid; that the company's bond is defective in that there is on it the name of only one resident of Kentucky.

INDICTMENT OF IRON PIPE MANUFACTURERS.

The United States grand jury returned a bill of indictment, April 7, at Chattanooga, Tenn., against six cast iron pipe companies for violations of the Sherman anti-trust law. The companies are charged particularly with having entered into an unlawful conspiracy and combination to control the output and prices of cast iron pipe in thirty-six states and territories of the Union. The case will be tried at the October term of the United States Court. The companies affected are: Chattanooga Foundry & Pipe Works, Addyston Pipe & Steel Co., Dennis, Long & Co., Howard-Harrison Iron Co., Anniston Pipe & Foundry Co., South Pittsburg Pipe Works.

THE GILSONITE AMENDMENT.

The "Gilsonite amendment" was reinserted by the senate April 15 in the Indian appropriation bill. The amendment is as follows: "That the mineral lands of the Uncompahgre Indian reservation in the state of Utah are hereby declared open to public entry under the mineral land laws of the United States, and no person shall be allowed to make more than one claim on lands containing gilsonite. And on and after Jan. 1, 1898, all of said reservation unalloted to Indians shall be open to public entry under the land laws of the United States."

If it becomes a law it will practically make a gift of mineral lands containing vast deposits of asphalt and gilsonite, estimated at 23,700,000 tons and valued at about $200,000,000, to those who make the quickest rush after the bill is signed.

STREET PAVING IN DETROIT.

Commissioner Moreland of the board of public works, Detroit, Mich., is in favor of having better pavements laid in that city than in the last few years. He is opposed to cedar block pavements on the ground that they are not sanitary and not smooth after having been down a short time. He believes that asphalt, when properly laid, will last longer than any other pavement. He says:

"Detroit now has 149 miles of rough and worthless pavement, every foot of which will soon have to be torn up. Of this, 145 miles are of cedar and four miles of stone laid on sand. In a total of 235 miles of pavement in Detroit there are but 37 miles of asphalt and brick, and it all ought to be made of these two materials. Brick for streets over which there is heavy traffic and asphalt for residence streets are what we ought to have. The brick we are using now are not the ordinary red brick, but they are a brick block, vitrified and hard as steel, and when properly laid will last for a quarter of a century with no repairs. The average cost of paving for cedar is $1.15 per yard; for brick, $1.85; for asphalt, $2.85. It costs more to lay good pavement, but when it is down it is worth something, and is cheaper in the end."

Mr. Moreland also argues that it is much wiser for the city to expend money in the way of paving, thus supplying work for the city's poor, than it is for the poor commission to dole it out to idle men in the winter or employ them on work that is unnecessary. In commenting on the expenditure of about $200,000 by the poor commission last winter in relieving distress, Mr. Moreland says:

"How much wiser it would be to pay that amount of money out to men employed in repaving the streets. It would give the men a chance to earn their living, and at the same time it would improve the appearance of the streets. In other cities they endeavor to keep their poor employed, and as a result other cities throughout the country are made beautiful and the cities are not turned into immense asylums in the winter for all the paupers and loafers in the country. Detroit in winter is a regular bonanza for tramps and worthless paupers, for they are well kept and they don't have to do enough to keep themselves warm."

WHEN COURTS CANNOT INTERFERE.

The supreme court of Iowa has handed down a ruling on the paving law to the effect that "if all the proceedings of city councils relative to public improvements comply with the provisions of the statutes in regard to all the dealings being perfectly square, and provided further that the work will not be oppressive to property owners adjacent to the street, that the courts cannot interfere, as the council is the sole arbiter of the necessity of the work being done. It is stated that the mere fact that property owners consider it oppressive should have no effect in view of the necessity of the improvement."

RULING IN FAVOR OF THE WATER COMPANY.

An opinion was handed down by the Supreme Court, April 12, in the suit of the Creston Water Works Company vs. the City of Creston, Ia., in which payment was refused the water works for water furnished the city during 1894, on the ground that the water was not up to contract; that the city could not pay an amount in excess of the special tax of 5 mills on property within the protected territory; that the contract attempts to exclude further regulation, and that the contract creates an indebtedness beyond the constitutional indebtedness. By the decision of the supreme court all of

these objections are overruled, the contract is sustained, and judgment for the full amount due for its full compliance is sustained.

WAUKESHA WATER FOR CHICAGO SCHOOLS.

The Waukesha Water Company, Waukesha, Wis., which laid a pipe line from that town to the world's fair grounds, has made a proposition to the Chicago board of education to lay branch pipes from the main conduit to furnish pure drinking water to the children in the public schools. The branch lines would be run direct to each school building.

MUST PAY FOR THE WORK.

The appellate court has reversed the decision of the lower court in the suit of William Kelly against the city authorities of New York City for the paving of Third avenue, from Ninety-sixth to One Hundred and Twenty-ninth street. The city paid for all the work, with the exception of a strip two feet wide along the outer rails of the railroad tracks on either side, which it was claimed the railroad company should pay for under the contract. The carriageway of the street was to be paved with granite block pavement, on a six-inch concrete foundation, "except in the space between the rails, known as the horseways, where no concrete shall be laid." Under the directions of the commissioner of public works, Mr. Kelly paved and concreted the roadway from the curb to the outer rail of the track, on either side, and when the work was completed he certified to the satisfactory manner in which it was done, and that it had been completed under the terms of the contract. One claim made by the defense was that the contractor had signed a general release when the last installment was paid him. Mr. Kelly, could not read or write, and was asked to sign a paper before the payment, and was assured that the signing would not interfere with his claim against the city, but the release was not read to him. The appellate court sustains Mr. Kelly's suit to recover for the paving of these strips unpaid for, Justice Ingraham, in his opinion, holding: "There is no more ground for excluding two feet on each side of the track than there is for excluding ten or twenty, or any other number of feet; and when this plaintiff was directed by the commissioner of public works to pave this carriageway up to the track, as work to be done under this contract, he was only doing what his contract obliged him to do, and for which he was plainly entitled to be paid."

Regarding the release, Justice Ingraham said: "It is quite clear that any release obtained under such circumstances would be void, as a surrender of a claim which the party executing it was assured by the officer who procured him to sign the paper would not be released."

PAINT FOR WATER HYDRANTS.

The water works department at Minneapolis, Minn., has about decided to paint the hydrants, horse fountains and sprinkling stand pipes a light vermillion red. The green paint which has been used heretofore is not satisfactory, owing to its having but very little preservative power against rust, thereby necessitating frequent applications. Graphite paint had been decided upon previously, but, being a dead black paint, the fire department objected to its use and suggested some striking color which would be easy to distinguish and also prove durable.

REPORT OF A MACON (GA.) COMMITTEE OF INQUIRY.

A report was submitted to the mayor and council of Macon, Ga., March 31, by J. W. Wilcox, city engineer, and William Lee Ellis, chairman of the board of public works, who visited Savannah, Ga.; Jacksonville, Fla.; Montgomery, Ala.; New Orleans, La.; Chattanooga, Tenn.; Atlanta, Ga.; Nashville, Tenn.; Louisville, Ky.; Terre Haute, Ind.; Indianapolis, Ind., and Evansville, Ind., to inquire into the merits of the different kinds of paving and the different methods of paving. The report was favorable to the use of brick on sand foundation on the majority of streets, and with concrete foundation on streets from 6 to 8 per cent. grades. "We saw numerous experiments with gravel, chert and macadam," the committee says, "none of which are any better than our own local gravel streets."

PROTESTS AGAINST THE DUTY ON ASPHALT.

Strenuous efforts are being made by the New England importers of asphalt to defeat the proposition to place a duty of $1.50 per ton on asphaltum, including crude asphalt. Some of the arguments are that this proposed duty, if included in the new tariff bill, would prohibit the importation of foreign asphalt, thus paralyzing an industry in New York and New England in which is invested over $25,000,000; that the western asphalt, to protect which the duty is asked, can now be laid for two-thirds the cost of imported asphalt; therefore, the only way in which the two compete is in quality; over $200,000 has

been expended in endeavoring to find in this country an asphalt which would be equal in quality to the imported asphalt, but nothing like it has been discovered; the importation of foreign asphalt amounts to $15,000,000 yearly, representing the amount actually used, one-half of the expense in laying being paid to American skilled labor, which will be thrown out of employment if the proposed duty becomes a law.

MAKING WATER WORKS OUT OF ANY OLD THING.

A new system of water works is being instituted in Jackson, O., by James Nunnally. He has undertaken to furnish water in unlimited quantities to subscribers in the East End, has contracted with the city for water for street sprinkling purposes, and will, as soon as possible, extend his plant to accommodate other parts of the city. The water is pumped from an abandoned shaft, near Fulton furnace, to a stand-pipe near by. The stand-pipe, which is the most curious part of the plant, was constructed by splicing together two furnace boilers, 56 feet in hight and 6 feet in diameter. The pipe is held in position by four large cables moored to it. Mr. Nunnally secured the mains which distribute the water from the recently dismantled Huron furnace.

COUNTY SURVEYORS IN MONTANA.

A bill passed recently by the Montana legislature places the highways of that state in the charge of the county surveyor and abolishes the old office of road supervisor. The act defines the powers and duties of the county surveyors about as follows: Each of these officers is required to keep the highways in his county clear of obstruction and in good repair; maintain bridges; make plans and specifications for new roads and bridges; to report to the county commissioners on all work completed, and if the work is done according to plans, specifications and contract he is to draw his vouchers for the same before payment is made. He is chairman of all boards of viewers of roads, keeps the records of road surveyors, and is the general superintendent of all roads. He may supply labor, teams, etc., and has power to contract for all work not exceeding $200 in cost; for larger amounts the approval of a majority of the board of county commissioners is required. The salary of the county surveyor varies with the class of county, from $750 to $2,000 per year, while viewers and all assistants of the county surveyor may not receive more than $3 per day.

THE COLUMBUS SEWER CASE.

The West Side sewer case, at Columbus, O., has been again taken under advisement by Judge Evans. The city contends that the boards of arbitrators, in arriving at their conclusion, had figured on slope measurement, which was in direct violation of the contract; that expert testimony could not be taken into consideration in a case of this kind, for the contract could speak for itself. The contractors say there is nothing to review and that the decision of the arbitrators is final.

RIGHT OF PROPERTY OWNERS TO BE HEARD.

An opinion was handed down April 5, by Judge J. W. F. White in the case of Oliva Falck vs. the city of Allegheny, Pa., to recover for the construction of a sewer made under local acts passed by the city of Allegheny prior to 1874, and under which acts the city could construct sewers and assess the abutting property owners, the latter having no right to appeal. Judge White, who finds for the defendant, says this rule is unjust and oppressive, and that property holders have a right to be heard, and is of the opinion that all local assessments for street improvements and sewers can only be sustained on the theory of benefits.

NEWARK'S METHOD OF PREVENTING THE LITTERING OF STREETS.

Ordinances have been passed at Newark, N. J., whereby the general superintendent of public works and his assistants are authorized to summarily remove any article that may be found incumbering any street, public lane, or alley, and a penalty of $5 is provided against the owners in addition to the cost of removal, and the article removed must be advertised thirty days and sold, unless sooner reclaimed, and the penalty and costs paid. Another ordinance requires owners and tenants to provide suitable receptacles in which to keep ashes and garbage, without such receptacles being filled to within four inches of the top; receptacles to be made of or lined with metal. The receptacles shall be placed on the sidewalk ready for the scavenger to empty and not longer than may be necessary for the removal of the contents by the scavenger. The penalty for failing to provide such receptacle, or for leaving it on the sidewalk unnecessarily, is $5.

WATER RATES FIXED BY ORDINANCE IN ILLINOIS.

Judge Shaw, of the circuit court, gave an opinion March 29, in the case of the Freeport Water Company vs. the city of Free-

port, Ill., in which he sustained the ordinance passed by the city council more than a year ago, lowering the rates for water services. The ordinance reduced the rates 30 or 40 per cent. and thereby materially lowered the revenues of the company. Judge Shaw holds that an ordinance by a city council, even though it amount to a contract, is not binding when against the public weal. Judge Shaw cited an act passed by the legislature in 1891, introduced by Representative George H. McCrone, which gave municipalities authority to fix rates by ordinance, subject to review and determination by the circuit court as to reasonableness.

MR. PURINGTON'S ADVICE REGARDING A BRICK PAVEMENT.

The agitation for street paving in Meadville, Pa., led A. M. Fuller, of that city, to address a letter of inquiry to D. V. Purington of Chicago, asking what kind of a foundation would be necessary for brick paving on Chestnut and Water streets, both of which have been macadamized. In reply, Mr. Purington said:

"From the fact that my factory is located far from your town I ought to be able to give you an unprejudiced opinion. Replying to your first proposition, I have no sort of question in my mind but you can place one course of brick on the old macadam streets and make practically as good a street in every particular as with six inches of concrete. Grade your street to say five inches below the proposed top of your pavement, roll with a heavy roller, put on two inches of sand with one course of brick, well rolled, and you will have as good a street as could be asked for. We put down two blocks in Galesburg, Ill., last summer, on a clay soil with two inches of sand and one course of brick, and after seven months it is as perfect as when first put down. One of the essentials in this kind of pavement is that the brick should be placed as close together as possible."

NEW KIND OF PAVING AT MACON, GA.

A new kind of paving has been laid in the residence portion of Macon, Ga. The process is described by Col. Wilcox, city engineer, as follows:

The street proposed to be paved is dug into until the clay subsoil is reached. This surface thus presented is rolled with a fifteen-ton roller to the proper cross sections and grade. Over the smooth surface five inches of coarse gravel, which has been prepared by the screening process, is laid, and over it is strewn an inch of fine gravel, which completely fills all the interstices. The street thus prepared is liberally sprinkled and is again rolled with a six-ton roller. This firm basis serves as the foundation for the pavement proper. In the composition cement, sand and the gravel mentioned figure as the component parts. The cement used is of a kind made in Georgia, and though not as good as Portland cement, is cheaper and serves the purposes for which it is intended. One part of this cement and two parts of sand are worked together in their dry state, and with the combination thus formed is mixed five parts of wet gravel. The entire mass is then thoroughly mixed, and is spread evenly over the foundation already prepared.

Col. Wilcox claims three advantages for the pavement: First, it has the merit of being cheap; second, it is particularly well adapted for horses, furnishing an even and springy surface to their hoofs; third, the streets paved with the material can be readily repaired, and by unskilled labor. The pavement is laid by the city employes at a cost of 72 cents a square yard.

DETROIT'S PLAN FOR GETTING CHEAPER BRICK PAVEMENTS.

The Detroit board of public works asked the council, April 20, for authority to purchase of the lowest bidder 2,250,000 brick. The board believes it can buy brick cheaper in such lots than contractors who buy in smaller quantities. It can then sell brick to contractors who secure the contracts for what the brick costs the city. The contractors, getting the brick so cheap, would be enabled to submit lower bids for their work. The innovation is undertaken with the restriction that the brick stand a test equal to that now imposed by the board upon all brick used. This intention of the board of public works was first noted in the March number of Municipal Engineering.

THE GROOVED RAIL IN BROOKLYN.

Mr. N. P. Lewis, engineer of street construction in Brooklyn, N. Y., has about succeeded in inducing the Brooklyn street railways to adopt the grooved rail. The president of the Brooklyn Heights railroad system said recently that he would soon order 5,000 tons of these rails and Mr. Lewis hopes that the use of them will be rapidly extended.

PROPOSED NEW ROAD LAW IN CONNECTICUT.

The good roads law of Connecticut, as recommended by the committee on roads, bridges and rivers, provides for three highway commissioners, one who shall be a civil engineer of ability and experience, and shall receive $2,000 and actual traveling expenses, the other two to receive $1,500 each annually and actual traveling expenses. Whenever a road shall be constructed one-half the cost shall be paid out of the state treasury, provided the whole amount does not exceed the sum of $100,000 in one year, and one-half of the cost shall be paid out of the treasury of

the town in which such road is constructed. The town is to keep the road in proper repair. The highway commissioners will supervise all the work and contracts and the construction of all roads.

NEWLY-ELECTED MAYORS.

As a result of the municipal elections this spring mayors have been elcted as follows: Thos. P. Taylor, Bridgeport, Conn.; Carter H. Harrison, Chicago; S. V. Smith, Davenport, Ia.; William E. Wagg, Lambertville, N. J.; B. C. Frost, re-elected, Phillipsburg, N. J.; Frank L. TenBroeck, re-elected, Asbury Park, N. J.; Nicholas Williamson, re-elected, New Brunswick, N. J.; J. C. Hoos, Jersey City, N. J.; Walling G. Sickle, Trenton, N. J.; Andrew McLean, Passaic, N. J.; Edward Kenny, East Newark, N. J.; Lawrence Fagan, re-elected, Hoboken, N. J.; George Pierson, Dover, N. J.; Mayor Seymour, re-elected, Bayonne, N. J.; Ex-Senator Hinchliffe, Paterson, N. J.; Alexander Maybaum, re-elected, Vailsburgh, N. J.; Wesley W. Pasko, re-elected, Caldwell Borough, N. J.; Gustav Tafel, Cincinnati, O.; Wm. C. Maybury, Detroit, Mich.; Robert McKisson, re-elected, Cleveland, O.; Samuel L. Black, Columbus, O.; James Allen Price, re-elected, Canton, O.; Samuel M. James, Toledo, O.; F. W. Vandusen, re-elected, Norwalk, O.; Mayor Riley, re-elected, Steubenville, O.; Lewis H. Gibson, Zanesville, O.; Matthew Merriman, Gallipolis, O.; John M. Good, Springfield, O.; Enoch F. Tyler, Ironton, O.; S. Mehaffey, Marion, O.; E. W. Hughes, Fostoria, O.; Chas. C. Glidden, Portsmouth, O.; Lemuel Heffries, re-elected, Wooster, O.; M. H. Levagood, Elyria, O.; George Predmore, re-elected, Warren, O.; P. White Brown, Chillicothe, O.; Alfred Tanner, Little Falls, Minn.; Harley S. Pulse, Lynchburg, O.; E. B. Week, Oldtown, Me.; Dr. John Bell, Benton Harbor, Mich.; A. L. McCutcheon, Albion, N. Y.; William Webster, Sault Ste. Marie, Mich.; Dr. J. A. McLeod, Ironwood, Mich.; A. A. Sherman, Coldwater, Mich.; Chas. Sturgis, Sturgis, Mich.; Wm. M. Akin, Evansville, Ind.; M. M. Stephens, East St. Louis, Ill.; John H. Finley, Warsaw, Ill.; O. H. Phillips, Larimore, N. D.; Forest F. Cooke, Galesburg, Ill.; G. A. Steinbach, Quincy, Ill.; F. J. Medill, Rock Island, Ill.; Loren E. Wheeler, Springfield, Ill.; W. F. Hite, Huntington, W. Va.; Chas. H. Fellows, Topeka, Kas.; Chas. S. Starkweather, West Superior, Wis.; R. L. Marshman, Kansas City, Kas.; Arthur C. Hastings, Niagara Falls, N. Y.; Francis C. Beadle, Matawan, N. J.; R. H. Mason, Gladstone, Mich.; J. M. Clafford, Iron Mountain, Mich.; M. F. Quaintance, Petoskey, Mich.; Milton Pettibone, Flint, Mich.; Parker Merrill, St. Louis, Mich.; W. W. Smith, Traverse City, Mich.; C. J. Davis, Lansing, Mich.; Milo Eastman, East Tawas, Mich.; A. A. Ellis, Ionia, Mich.; A. M. Stearns, Kalamazoo, Mich.; J. Will Kirk, Adrian, Mich.; H. C. Hall, Hudson, Mich.; John Mulcrone, St. Ignace, Mich.; A. T. Donaldson, Mt. Clemens, Mich.; James E. Sherman, Marquette, Mich.; P. W. Kirkwood, Negaunee, Mich.; James Trebilcock, Ishpeming, Mich.; Thomas Smurthwaite, Manistee, Mich.; App. M. Smith, Ludington, Mich.; Wm. T. Dodge, Big Rapids, Mich.; William Holmes, Menominee, Mich.; Geo. F. Heath, Monroe, Mich.; Cass T. Wright, Greenville, Mich.; Ansel F. Temple, Muskegon, Mich.; W. R. Smith, Holly, Mich.; Gerritt J. Diekema, Holland, Mich.; J. George Zink, St. Clair, Mich.; Tyler Morley, Marine City, Mich.; Edwin Gould, Owosso, Mich.; A. S. Marshall, Corunna, Mich.; C. A. Dockstader, Three Rivers, Mich.; N. B. Harding, Ypsilanti, Mich.; C. E. Hiscock, Ann Arbor, Mich.; F. A. Diggins, Cadillac, Mich.; F. W. Richter, Niles, Mich.; H. P. Webster, Eaton Rapids, Mich.; W. I. Price, Bessemer, Mich.; R. H. Mason, Gladstone, Mich.; Charles Bennett, Charlotte, Mich.; M. Devereaux, Mt. Pleasant, Mich.; Martin G. Loennecker, Jackson, Mich.; F. A. Townsley, Midland, Mich.; Levi Camburn, Stanton, Mich.; F. J. Kelly, Pontiac, Mich.; J. V. B. Goodrich, Grand Haven, Mich.; C. W. Van Slyke, Mason, Mich.; E. K. Tarbell, Winona, Minn.; Samuel MacKrem, St. Cloud, Minn.; F. E. Bissell, Litchfield, Minn.; E. L. Welsh, Henderson, Minn.; Peter Miller, Rushford, Minn.; Edward Phelps, Laurel, Md.; Joseph Baer, Frostburg, Md.; Dr. John F. B. Weaver, Manchester, Md.; William Wood, Union Bridge, Md.

NEW PUBLICATIONS.

"The Materials of Construction," by J. B. Johnson, 800 pp. Price, $6. John Wiley & Sons, New York.

Professor Johnson has entered the field of books such as Thurston's "Materials of Engineering," by giving in this volume the latest information of the methods of testing materials and the results of many tests by experienced and reliable operators. The book should properly be named "Materials of Engineering Construction," as that field only is entered and is not entirely covered. It opens with a statement rather supplementary to the ordinary text books on mechanics, of some of the principles underlying the laws of strength of materials. The subjects of the action of materials under compression and

under cross-bending stress and of resistance are more fully treated than is usual. The subjects of iron and steel are not so exhaustively treated as in Professor Thurston's work, but timber and cement have full space. The descriptions of timber and of the methods and results of testing are specially full, the author being connected with the work of the forestry division of the United States department of agriculture and having directed the tests of southern pines, which are the only timbers that have yet been studied in detail by that department. This part of the book is largely taken from the reports and records of the department of agriculture and is authoritative.

Cements are more fully treated in the matter of tests than in any preceding book. The methods of manufacture and composition of cements are but briefly touched upon, and but little attention is paid to the differences between natural and artificial cements, except in the tables of results of tests and comparisons of economy of concrete of equal strength. Much remains to be said on this subject and the best book possible has not yet appeared. The rapid advance in the knowledge of cements of late warns the prospective author that his book will very shortly be out of date unless he confines himself to the most general outlines. Paving brick appear for the first time to any extent in a text book. The reports on methods of test for the National Brick Manufacturers' Association are given in full abstract, and also a chapter on their manufacture written by a manufacturer. The book is not large enough to hold statements of all the materials of construction, but those of the most importance have reasonably full treatment and the specialist must look to the treatises, reports and papers on his own subject for full treatment of any material. The book is very largely a compilation and is specially full and reliable on the subjects in which Professor Johnson has had practical experience. He has used good judgment in his choice of authorities for the other subjects treated and has prepared an excellent text-book, which will serve, on the whole, as a good book of reference as to methods and a fairly full record of results of tests, but is rather brief in the line of descriptions of methods of manufacture and effects of such methods upon character of material.

"Hydraulic Cement," by F. P. Spalding. 265 pp. Price, $2. John Wiley & Sons, New York.

Professor Spalding has given in this book a discussion of cement which covers the theoretical ground asked for in the foregoing notice of Johnson's "Materials of Construction," and has paid some attention to the practical application to the use of cements. The book reads like one for the use of students in college rather than like a hand book for the practical user of cement, but every engineer would be the better prepared for selecting a cement for a particular use, and for deciding upon the acceptance of consignments of cement, after a careful study of it. The work follows the same general plan as the one just noticed, giving first a description of the various kinds of lime and cement and brief statements of the methods of manufacture, then the mode of action and effect of various impurities, followed by statements of the methods of testing, covering tests of all degrees of importance. A short chapter on the proportions of mortar and concrete closes the book. Five short sets of specifications for cement follow in an appendix, one for the Pennsylvania railroad, one for the masonry for the Canadian Pacific railroad, one for dock work in Brooklyn, one for masonry and concrete on St. Louis water works and one for municipal work in Philadelphia.

The cement question is not yet reduced to exact statements, and nothing new is offered which will aid in the solution of the many problems now under discussion. Some statements by the author will be objected to by experts, but the book will be valuable to students and to engineers who have not made an exhaustive study of the subject.

A very few points are selected at random for mention. It has recently become more common to specify the 10,000 mesh sieve in tests for fineness rather than 2,500, as stated on page 104, especially for Portland cements where the American Portlands are popular. Full account is taken of the effect of the personal element in making tests and the necessity for the fixing of a local standard by each laboratory or testing department is well emphasized. The use of a testing department on construction is simply to determine the relative value of shipments of brands selected on account of their success in actual work or after a full investigation by experts. The author is evidently of this opinion, though he does not go into the everyday details of this branch of the work, leaving the tester to select as much as he needs from the data given. The discussions of the relative values of different cements are based upon the chemical constitution, and are as satisfactory as the indefinite state of our knowledge will permit. The authorities quoted are largely European, as there are few American writers on the

subject. The American cement industry is rapidly developing, and in some lines is quite different from any European examples. A statement of the methods of selection and mixture of material and production and grading of products would be of great interest and value.

A very important use of cement is in municipal work—that in sidewalks—is omitted, though probably as severe a test of cement as any use to which it is put. A specification for cement for municipal work should contain provisions for natural cement for ordinary brick and stone masonry and concrete, for Portland cement for masonry, concrete and sewer work, and for high grade Portland cement for sidewalks and artificial stone.

The only serious criticism unfavorable to the book is that upon the shortness of the last chapter. Besides the methods of tests the principal use of a book on cement for the young engineer in practice is for aid in determining the grade of cement to use for a given purpose, the proportions of the mixtures for mortar and concrete, the economy of cements of different prices and strength, and the practical details of manipulation. The chapter treating these subjects is too short to contain what it should to satisfy anyone on this part of the subject. This does not detract from the considerable value of the rest of the book.

Report of the Board of Water Commissioners of Troy, N. Y.:

The forty-second annual report of the board of water commissioners of Troy, N. Y., has been presented by Clerk George B. Fales to the board, and will, when printed, be sent to the common council. The report showed resources for the year of $107,263.69 and expenditures amounting to $104,954.79. The quantity of metered water for the year was 415,961,007 gallons.

Superintendent Dolan also submitted his report of the operations of the department in detail and concluded with the recommendation that during the sprinkling season temporary gate valves be placed on such fire hydrants as are used for street sprinkling. With the device the hydrants would be open at full head all the time and the gates could be used by the sprinklers and also by the fire department in case of fire.

Annual Report of the City Engineer of the City of Minneapolis, for the Year Ending December 31, 1896. By F. W. Cappelen, City Engineer:

Mr. Cappelen reviews quite fully the details of the work done under the direction of his department, and his report embraces a number of maps, drawings and photographic views, together with statistical tables. These are quite interesting and some of the views are reproduced elsewhere in this magazine. Under the heading of paving Mr. Cappelen recalls that the first cedar block pavement laid in 1882 cost $2.225 per square yard, nearly as much as recent asphalt pavements. He mentions the delay in awarding contracts last year till the middle of the summer as the unnecessary cause of much trouble experienced in completing paving work during cold weather. Mr. Cappelen favors the requirement of a ten-year guarantee on asphalt pavements. This, in Minneapolis, cost $2.95 per square yard, exclusive of grading, in 1896. The relaying of street railway tracks in Minneapolis, in connection with which there were some interesting features described in a paper by Mr. Cappelen published in the November number of Muncipal Engineering, also receives extended attention in this report.

Figures are given showing the cost of cleaning and sweeping asphalt pavements on three streets on the block system. One man takes care of two blocks of about 5,000 square yards, by the use of what is called the "boss scraper" and a hand broom, working every day except Sunday. The cost of sweeping ranged from 0.46 to 0.87 cents per square yard per month, and of cleaning from 0.28 to 0.59.

Much of the report is devoted to a description of the work on the water reservoir, illustrations of which appear in the May number. The mechanical equipment of the water works and the quality of water are also discussed. Mr. Cappelen also sets forth some valuable information regarding electric street lighting, much of which was gathered from other cities by a committee of the American Society of Municipal Improvements, of which he is a member. The report also gives quite full information regarding the construction of subways for telephone, telegraph and electrict light wires, supplemented with facts from other cities where similar work has been done. The report altogether is very complete.

Fourteenth Annual Report of the Board of Park Commissioners of the City of Minneapolis, for the Year 1896:

This report is beautifully illustrated with views of Minneapolis parks, which are among the most attractive of any city in the country. A general review of the aims of the park commission is given by the president, William W. Folwell. Little could be done during the last year on account of a decline in the revenues from taxation. The situation in Minneapolis is one that affords opportunity for great development and the engineer in charge, Mr. Frank H. Nutter, should be given authority to make the most of it.

Annual Report of the City Officers of South Bend, Ind., for the Year Ending Dec. 31, 1896:

The report of the city engineer, Mr. W. M. Whitten gives a very full statistical record of all public work. A comparison of the average cost of brick and cedar block pavements shows that the former has been 96 cents per square yard and the latter 75½ cents. Mr. Whitten says that the brick pavements put down seven years ago are still in good condition, but the cedar block pavements laid since that time are badly worn and all of them will need renewing before they have been paid for under the ten-year installment plan. With one exception the brick pavements are all laid in a single course at an angle of forty-five degrees with the street, on six inches of gravel thoroughly rolled. This has proved satisfactory except on streets with railway tracks. Mr. Whitten thinks that these defects can be remedied by putting the tracks on a foundation of eight inches of concrete. He thinks that where the brick are laid diagonally across the street the pavement is smoother than when laid in straight courses. Mr. Whitten does not regard as important any of the usual tests of paving brick, except the one for abrasion. He discounts the absorption test, and says, "the degree of vitrification necessary to produce the best pavers is by no means constant for all clays, and I believe it to be the concensus of opinion of those best informed on the subject that over burned brick, which may be quite impervious on account of overburning, do not stand the best actual service in the pavement. Admitting then, this to be a proper test for vitrification, it does not necessarily follow that it is a true test of the meris of pavers, especially between those made from different clays. As to the value of this test in determining the effect of frost, I will say that we have brick in our pavements that will absorb 7 or 8 per cent. in 48 hours, that are not affected in the least by frost, while specimens of other material that absorb less than 3 per cent. have been seriously injured by freezing. My observation leads me to conclude that laminations produced in the process of manufacture are more liable to cause disintegration by freezing than lack of sufficient vitrification.

In discussing the abrasion test, Mr. Whitten says that this "seems to come nearer to a true test for pavers, than any other or all others combined, but up to the present there seems to be very little uniformity in the manner of conducting the tests, and consequently no agreement as to a standard with which to compare results. The percentage of loss in weight of the several specimens is, usually, taken as a comparison. It seems to me that this cannot be a fair test unless the specimens are all very nearly of uniform size. The loss by abrasion in the rattler takes place on the surface only, and chiefly on the edges. The edges of the standard sized brick bear a much greater ratio to its weight than the edges of one of the large paving blocks bears to its weight. For example, the standard size brick, weighing say 7 to 7½ pounds, has 58 lineal inches of edges, or say eight inches to each pound weight; a block weighing 10 to 10½ pounds has 64 inches of edge, or say 6.4 inches to each pound weight. If the loss takes place on the edge only, with a given loss per unit of edge, it is evident that the percentage of loss would be 25 per cent. greater in the brick than in the block. In other words, if the brick showed one-fourth greater percentage of loss than the block, the loss per unit of edge would be about equal, and indicate the material to be about equal in its resistance to abrasion. From limited tests recently made with specimens of several varieties of brick that have seen actual service in our pavements, I believe that he abrasion test, with the loss per inch of edge, used as a comparison, will indicate more closely than any other method, the relative merits of different materials for street pavers."

Mr. Whitten's explanation of the defects and difficulties in the sewerage of his town is quite clear, and it would be to the advantage of the city to follow his advice. He recommends the appointement of an inspector of plumbing and drains to prevent improper and unsanitary connections and misuse of the sewers, and he also gives some pertinent advice as to the qualifications of such an officer.

Annual Reports of the City Engineering Department of the City of Scranton, Pa., for 1895-96. By Jos. P. Phillips, City Engineer.

This pamphlet embraces the reports of the city engineer for two years. The last shows that Scranton now has over fifteen miles of pavement, nearly eleven of which is asphalt. Mr. Phillips thinks that the city is at fault in neglecting the repair of asphalt streets on which the guarantee has expired and recommends an appropriation of $10,000 for the purpose during this year. He thinks, too, that the durability of the asphalt pavements can be improved by securing a better quality of sand than is locally available for the mixture.

Reports of the Officers of the City of Rockford, Ill., for the Fiscal Year, 1896:

The construction and installation of an electric lighting plant was the principal work requiring the attention of City Engineer Stowell last year. The details of

this and the items of cost are fully set forth. The metering of water has increased. The water pumped in 1896 amounted to 86 per capita of population, which is below the average.

Twenty-Fourth Annual Report of the Water Board, Superintendent of Water Works and City Engineer of Lowell, Mass.

Fifty-First Annual Report of the Village of Oberlin, O.

Report of Samuel M. Gray, Consulting Engineer to the City of Terre Haute, Ind., on the Plans of a Sewer System Prepared by John A. Cole, C. E., with Recommendations.

Annual Report of the Somerville Mystic Water Board for 1896.

PERSONAL.

A. Weir Gilkeson has been elected borough surveyor, at Bristol, Pa.

Samuel S. Hoff has been elected city engineer at Reading, Pa.

C. J. Barr has been elected highway commissioner at Lebanon, Pa.

Levi Garner has been elected street commissioner at Doylestown, Pa.

James Gibbons has been elected street commissioner at Bangor, Me.

W. C. Peters has been made consulting engineer at San Antonio, Tex.

Charles H. Young has been elected water commissioner at Trenton, N. J.

Percival Goldin has been elected water commissioner, at Catskill, N. Y.

John A. Affleck has been chosen water commissioner at Harrisburg, Pa.

Joseph P. Phillips was re-elected city engineer April 12 at Scranton, Pa.

John Harvey has been appointed assistant city engineer at Hamilton, O.

Thornton M. Stout has been chosen water superintendent at Shenandoah, Pa.

George L. Newton has been elected street commissioner at Weymouth, Mass.

William C. Staley has been elected water commissioner, at Lansingburg, N. Y.

Charles E. Grant has been appointed water commissioner at Beatrice, Neb.

John Edmunds has been appointed superintendent of streets, at Sangers, Mass.

Daniel J. Marsh has been reappointed park commissioner, at Springfield, Mass.

Daniel F. Prindle has been appointed street commissioner at Hamburg, N. Y.

William Nelson, city engineer at Laconia, N. H., has been elected street superintendent.

Felix A. Jacobs has been appointed director of public improvements at Columbus, O.

Edward Tremaine has been appointed superintendent of streets at Hinsdale, Mass.

John Wasmouth has been elected superintendent of water works at Marquette, Mich.

L. E. McGann has been appointed commissioner of public works at Chicago, Ill.

J. M. Butler has been elected supervisor; A. A. Smith, town clerk, and J. J. Danforth commissioner of highways, at Deer Creek, Ill.

Edward F. Frailey has been re-elected superintendent of water works, at Lancaster, Pa.

David Henry and I. A. Hall have been appointed park commissioners, at Paterson, N. J.

Frederick W. Herzog has been elected highway commissioner at Oyster Bay (L. I.), N. Y.

P. D. O'Connell has been elected superintendent of water works, at Somersworth, N. H.

Wilson S. Hamilton has been appointed superintendent of water works at Youngstown, O.

H. B. Greenawalt and W. F. Reed have been elected street commissioners at Dauphin, Pa.

John B. Hawley, Assoc. M. Am. Soc. C. E., was elected city engineer, April 6, at Fort Worth, Tex.

J. M. Culpepper and J. B. James have been elected water commissioners at Fort Valley, Ga.

C. L. Haines has been appointed chairman of the Board of Public Works, at Salt Lake City, Utah.

George D. Snyder, M. Am. Soc. C. E., was re-elected city engineer at Williamsport, Pa., April 12.

Joseph Stickney has been appointed assistant superintendent of streets and sewers at Ruthland, Vt.

C. S. Maxwell has been elected city civil engineer, to succeed Albert Howell, at Zanesville, O.

C. H. Ladomus has been re-elected surveyor and B. H. Smith street commissioner at Chester, Pa.

Amos L. Schaeffer has resigned his position as second assistant city engineer at Niagara Falls, N. Y.

Joseph W. Suddard has been elected president of the board of west park commissioners at Chicago, Ill.

D. M. Munro has been appointed superintendent of water works and electric light plant at Rockville, Md.

A. C. Grover, C. E., has been appointed city engineer and superintendent of streets and water works at Rutland, Vt.

Peter E. Spurck, a member of the firm of the Spurck Paving Brick Co., Peoria, Ill., died in that city March 24, aged 66.

F. A. Dunham, C. E., has moved his office from 150 Nassau street, New York City, to St. Paul Building, 220 Broadway.

Warren F. Cressman of Sellersville, Pa., has been appointed engineer to supervise the erection of new water works in that city.

Geo. M. Brill, M. Am. Soc. C. E., succeeds Stevenson Towle, resigned, as consulting engineer of street improvements, New York City.

Geo. Small, John L. Morris, Edward I. Gardner and Geo. H. Baker, have been appointed sewer commissioners, at Ithaca, N. Y.

Henry Ziegenheim has been elected Mayor at St. Louis, Mo., E. F. Meier was elected president of the council and Robt. E. McMath was re-elected president of the board of public improvements.

Morris Hammond, Jas. MacFarland, Rufus Mead and Peter Gerbert were elected surveyors of highways, April 13, at Orange, N. J.

W. H. Lindsay has been engaged as engineer to supervise the construction of the additional water works plant at West Chester, Pa.

John S. Blandon has been appointed superintendent of the Crystal Springs Water Co., Bethlehem, N. H., to succeed Bert Cram, who resigned.

Geo. W. Patterson has been elected president of the board of water commissioners at Westfield, N. Y., and F. W. Crandall acting superintendent.

Colin R. Wise was appointed surveyor, April 20, at Passaic, N. J., by Mayor McLean, and Thomas Giblin was made street superintendent.

Charles H. Spencer has been appointed secretary of the board of park commissioners, at Indianapolis, Ind., to succeed Col. W. R. Holloway.

Dr. M. M. Lown has been elected president of the water works trustees for the ensuing year at Findlay, O. Frank Veon has been elected chief engineer.

William G. Wilkins, city engineer at Allegheny, Pa., has resigned his position, and his assistant, G. C. Langenheim, has been appointed to succeed him.

Harrison Souder, C. E., has been appointed assistant superintendent of bridges in the bureau of highways, department of public works at Philadelphia, Pa.

William Stainsby, Peter Ulrich, Theodore C. Hewson, Harrison Van Duyne and Chas. F. Herr have beeen elected to the new Board of Works at Newark, N. J.

H. L. White of the firm of White & Wetherbee, civil engineers of Brockton and Braintree, Mass., has been appointed superintendent of streets at Braintree.

Jason N. Shepardson, superintendent of streets, Pittsfield, Mass., has resigned his position and will be succeeded by John M. Hatch. Frank E. Hatch succeeds his father as superintendent of water works.

Major Chas. F. Powell, U. S. A., Washington, D. C., has succeeded Major Richard L. Hoxie, U. S. A., in the U. S. Engineer's office in Pittsburg, Pa., and will be in charge of the Monongahela river improvements.

Alexander Potter, assoc. M. Am. Soc. C. E., has been appointed consulting engineer to the American Gas and Water Corporation of New York, controlling twenty gas and water works plants throughout the country.

Col. W. F. Morse, who has been identified with the construction of several of the largest garbage crematory and disinfecting plants in this country, has opened an office and re-established this special line of work at room 207, Nos. 56 and 58 Pine street, New York City.

Stevenson Towle has resigned his position as consulting engineer in charge of street improvements in the department of public works, New York City. Mr. Towle's health has been impaired by giving too strict attention to the duties of his office.

A. S. Vogt, of Altoona, Pa., has been chosen a member of the committee of experts to examine into the cost and advisability of a municipal electric lighting plant for Philadelphia. The other two experts, M. R. Muckle, Jr., and J. J. DeKinder were appointed about a year ago.

Col. Edward P. North has been made consulting engineer to the commissioner of public works, New York City, on matters concerning street construction, pavements and allied subjects. Charles W. Barney has been made water surveyor, to succeed Col. North, under whom he was chief inspector of streets.

Mr. W. M. Whitten, for seventeen years city engineer of South Bend, Ind., and one of the most prominent men in the profession in Indiana, was defeated at the annual election on April 26th, a personal fight having been made against him by councilmen who felt that he had not shown them due consideration. His succesosr is W. H. Rosencrans, engineer of the I. I. & I. railway.

The water works commissioners of Cincinnati, O., have appointed a committee of five expert engineers to inspect the plans for the new water works, as follows: Henry Flad of the Mississippi River Commission; M. L. Holman, water commissioner and engineer, St. Louis, Mo.; Charles Hermany, engineer of the water works at Louisville, Ky.; Samuel Felton, C. E., Cincinnati, and Clemens Herschel, M. Am. Soc. C. E.

A. L. White, city engineer and of the firm of Hoge & White, Wheeling, W. Va., has been put in charge of all public work under the general control of the boards of councils. The recent passage of an ordinance, which is very comprehensive, requiring that accurate survey be made of the entire city, monuments placed, and maps made of water, gas and sewers, compels Mr. White to withdraw from the business firm of Hoge & White.

City engineers have been elected this spring as follows: J. W. Burt, Chadron, Neb.; A. D. Hayes and E. L. Cook, Belfast, Me.; Charles Greever, Leavenworth, Kas.; Asa Hosbrook, Madisonville, O.; C. F. Beyha, Neligh, Neb.; Henry Sandritter, Blue Springs, Neb.; Minor C. Taft, Kalamazoo, Mich.; J. C. W. Kline, Oakland, Neb.; G. M. Walker, Keokuk, Ia.; H. M. McIntoch, re-elected, Burlington, Vt.; Myron Shepard, Stillwater, Minn.; J. N. Towle, Fall City, Neb.; W. E. Benjamin, Hebron, Neb.; Olie Olsen, Holdredge, Neb.; I. M. Chaffirr, Humboldt, Neb.; M. B. Cowden, Harrisburg, Pa.; A. B. Lind, Stromsburg, Neb.; Benjamin E. Briggs, Erie, Pa.; John B. Hunter, Denver, Col.; Samuel S. Hoff, Reading, Pa.; E. P. Parsons, Fond du Lac, Wis.

LETTERS FOR THE PUBLIC.

THE DES MOINES WATER WORKS CONTROVERSY.

To the Editor of Municipal Engineering:

The council of the city of Des Moines in 1871 passed an ordinance authorizing the Des Moines Water Company to construct, maintain and operate a system of water works in the city for a period of forty years. The city then had a population of about ten thousand, and ten miles of mains were to be installed at once. The rates charged for fire protection and private consumption were to be "the average price paid therefor in other cities of the United States having efficient water systems operated by private companies." A system of arbitration was provided in the ordinance in case the water company and the council failed to agree on these rates.

Under the franchise the system was built and operated for a period of ten years. The water service, however, did not keep pace with the demands of the rapidly growing city. Muddy, unfiltered water and a lack of efficient fire protection, called forth loud protests from the citizens. The city council, backed by public opinion, refused to pay public rentals until improvements were made. Appeal was made to the courts, but no definite results appeared. As a matter of compromise, influential citizens were induced to accept stock, new blood and more money were secured, and the Des Moines Water Works Company organized. A new source of supply was gotten, new pumps and boilers installed and larger distributing mains laid. A new ordinance, known as "The ordinance of 1883," was passed and accepted, which materially reduced the public rentals. This compromise was conditioned, however, that no further changes were to be made for ten years.

Meanwhile, the towns suburban to Des Moines made efforts to secure water works. North Des Moines gave a franchise to the North Des Moines Water Company in 1887. Ten miles of mains were laid and a standpipe built. The towns of Greenwood Park and University Place each granted a franchise, and one and one-half miles of mains in each town was laid in 1889.

It is interesting to note the ownership of these interests at this time (1889). K—— & Son owned 468 of the 500 shares in the Des Moines Water Works Company and all the interests in Greenwood Park and University Place. The Son owned the North Des Moines franchise.

Greater Des Moines was made possible by an act of the Legislature, and in 1890 Des Moines, Greenwood Park, University Place, North Des Moines, and other independent towns were united under the corporate name of the city of Des Moines. Following this step the water companies in these various towns being practically owned by one firm, were united under the name and management of the Des Moines Water Works Company.

Bonds to provide for extensions and the purchase of these smaller plants were issued. In 1883-5 bonds to the amount of $132,500 secured by a first lien on the property were sold. In 1888-9 what are known as the first mortgage bonds, to the amount of $667,000, were disposed of, and a second issue of $150,000 is secured by a first lien on the suburban pipe systems and a third lien on the main system, making a total of bonds outstanding of $949,500. Beside the bonds outstanding there is stock issued to the amount of $500,000.

The ten years' peace agreed upon in the ordinance of 1883 having expired, the City Council being convinced that the rates of the ordinance of 1883 were excessive and unreasonable, passed a regulating ordinance known as the ordinance of 1893, reducing rentals and rates. This ordinance the water company refused to accept and continued to collect rentals according to the ordinance of 1883 and threatened to deprive consumers of water service if these rates were not paid. Complaint became so general, and no relief being immediately availabale, the city appealed to the courts, alleging (1) that the water company had no contract with the city because of the interminable character of the section of the original ordinance covering rates, and (2) that rates should be determined by a reasonable return on the investment. This view of the case was sustained by the Supreme Court of the state, and the case remanded for hearing on its merits. The case has been tried in the District Court and was appealed to the Supreme Court, where it is now under consideration.

In the trial of the case to determine what would be reasonable rates, some interesting facts were developed. Expert engineers employed by the water works company testified that it would require from $800,000 to $850,000 to duplicate from new materials the present plant.

Engineers expert in water works design and construction, employed by the city, affirmed that the plant can be reproduced for $495,000 to $620,000.

It was fully set forth that while the plant was bonded for $950,000 this amount had not been spent in construction.

The present distributing system consists of 81¾ miles of mains varying in size from four inches to twenty-four inches in diam-

eter, of which 74¼ miles (or 90 per cent.) is 4-6 and 8-inch pipe.

The system being originally designed for a city of modest aspirations, has been extended year by year to supply consumers in the rapidly-growing city and has become a vast network of small pipe insufficiently supplied with large distributing mains.

The abuse of a franchise which, if handled judiciously, would have proved a profitable investment has driven public opinion to demand municipal ownership. The legislature in 1896 provided means by which Des Moines or any city of like size in the state might acquire its water system. Municipal control has been an issue in city politics. A tax has been assessed and is being collected for buying or building.

Two courses are open to the city: Buy the present works or build new. Obviously, the former is to be preferred if the city can buy at a reasonable figure. Numerous plans for selling the plant have been submitted by the water company. Three years ago a half interest in the plant was offered to the city for $1,300,000. Today it will gladly take the amount of the bonded indebtedness, $950,000, for the whole plant. In order to save litigation and delay, but believing it to be more than the plant is worth, the city offered the water company in 1896 $800,000 for the plant, which, after due consideration, was refused. With public opinion as it is today this offer or one approaching it will never be made again.

The city is taking steps to inaugurate investigations for a large and pure water supply, and the design of an independent water system.

At this writing no agreements or settlements as published in the various contract journals have been made. L.

Des Moines, Ia., April 20.

A PUBLIC TESTING STATION FOR CEMENT.

To the Editor of Municipal Engineering:

In the April (1896) number of your valuable magazine there appeared a very able paper written by Prof. J. M. Porter of Lafayette college, Easton, Pa., on the subject of "Tensile Strength in Cement Specifications," in which he showed that nine tests made of the same cement, made by nine different persons, in different localities, each according to their understanding of the method proposed by the Committee of the American Society of Civil Engineers, gave entirely different results, the tensile strength ranging from 75 lbs. to 247 lbs. In concluding his article, he says, "personal equation is a decidedly important factor in cement testing," etc. While I agree with him to a certain extent, yet it has also been proved that climate has something to do with it, and there are cases on record where the same party has tested the same cement (once at the factory and then on the work, several hundred miles distant), knowing the two samples to be identically the same cement, not simply from the same factory, but taken from the same lot, and he obtained quite different results. This being the case, it is evident that climate and other causes as yet undiscovered, are responsible for these changes. Under these circumstances, it is difficult for the contractor who is furnishing cement subject to test to feel any security, as, while he may have abundant evidence that his cement has more than filled the requirements asked for, in numerous cases, he fears there may be something for which his cement is not responsible that may cause it to be rejected.

In Germany there is a public testing station in Berlin and the tests coming from that place are accepted everywhere. I would respectfully suggest that it would be for the mutual good of engineers and contractors if we, in this country, could have a similar testing station, where the tests should be recognized, although, considering the differences that would naturally appear in various parts of this great country, I would suggest that there be several testing stations, such as the principal universities of the country, where cement testing has been made a study of late years.

I merely offer this as a suggestion, and will be glad to see the subject ventilated. Meanwhile, I remain, yours respectfully,

E. W. FISHER.

New Orleans, La., April 12.

REDWOOD PAVING IN SAN FRANCISCO.

To the Editor of Municipal Engineering:

In the April number I notice that you have mentioned the recent specifications I prepared for the Merchants' Association. Pine was mentioned as a paving material, but I doubt whether any of it will ever be laid, as it costs $26 per M to creosote it. The best figures we have received on Eucalyptus show that it will cost from 30 to 50 cents per square foot. These two materials were put in the specifications to prevent talk of favoritism, but redwood, which is being laid in this city in large areas, was not mentioned by you. The wood specifications were really prepared in the interest of this material, which has proven to be a success. It costs about 20 cents per square foot on concrete.

ERNEST M'CULLOUGH.

San Francisco, April 6.

MACHINERY AND TRADE.

A NEW BLOCK FOR SINGLE COURSE PAVEMENTS.

The city council at Galesburg, Ill., will probably pave some street with the new block, manufactured by the Purington Paving Company, to test its qualities. The blocks are larger than the ordinary brick, being nine inches long by three and one-quarter inches on face, and four inches high. They are so much broader than the ordinary brick that it is believed that they will not settle so readily, and will preserve a more even surface. The block is for single course pavements.

CORK BRICK PAVEMENTS.

A new material intended specially for use in paving bridges, courtyards, stables, roadways, etc., consisting of ground cork and asphalt compressed into brick shape, is now attracting considerable attention, especially in the East. Cork brick as a street paving material was referred to in the Question Department of our April number.

It is claimed for cork brick pavement that it gives an absolutely secure foothold for horses and pedestrians in any weather; that it is non-absorbent and therefore makes a perfectly inodorous roadway; that it absolutely subdues sound and produces less noise than any other class of pavement.

It has been laid in various places in the East. Mr. H. O. Havemeyer, New York City, whose stable and the roadway leading to it were paved with cork several years ago, speaks very highly of it, stating that the pavement has given perfect satisfaction.

The stable of H. Garner & Co., New York City, was paved with cork brick in 1894, as was also that of the H. J. Heinz Company, Pittsburg, Pa. Both these companies keep heavy truck and draft horses in their stables, and, though the pavement has been down almost three years, it shows no appreciable wear. It is claimed that owing to the elasticity of the material a horse standing on it after being out on hard pavements all day will last from three to five years longer.

A representative of Municipal Engineering had an opportunity to inspect the pavement laid in H. O. Havemeyer's stable and also that laid in the stable of Col. O. H. Payne, New York City. Both are in excellent condition, though no repairs have been made since first put down.

Cork brick have heretofore been manufactured only in England, but rights have been secured by one of the leading asphalt paving companies of the country, who will manufacture them for use in the United States.

TRADE PUBLICATIONS.

"A Few Points on Up to Date Street Drainage" is the title given to a small illustrated pamphlet issued by George M. Pierce, No. 8 Euclid avenue, Cleveland, O., describing the advantages of the Duplex catch basin cover or sewer inlet.

The Crown Fire Clay Co., of Akron, O., has issued new pamphlets describing and illustrating their sewer and culvert pipe and fire brick, and giving also price-lists.

Much useful information can be gathered by users of Portland cement from the little book published by the Buckeye Portland Cement Co., of Bellefontaine, O., entitled, "How to Use Portland Cement." The last edition is the sixth, making 100,000 in all. Copies will be mailed to any address on request.

The Clinton Paving and Building Brick Co., of Clinton, Ind., have set forth some strong points in favor of their paving brick, in a little publication which they call "Facts and Figures Worth Reading for Municipalities."

TRADE NOTES.

The Central Sewer Pipe Co., Cleveland, O., has been incorporated by Harry Thompson, David E. Hill, Charles F. Chapman, Alex H. Commons and John W. Chapman, to manufacture and sell sewer pipe, terra cotta and clay products.

The purchase of a stone crusher is contemplated at Littleton, N. H.

The selectmen at Dover, Me., contemplate the purchase of a road machine.

The town of Hartland, Me., has voted to make an appropriation for the purchase of a road machine.

The town of Great Barrington, Mass., voted, March 22, to appropriate $1,200 for a stone crusher. John B. Chadwick, selectman.

The Aultman Co., Canton, O., made a recent sale of a 5-ton steam road roller at De Land, Fla.

The Dunn Manufacturing Co., Pittsburg, Pa., secured a contract from the city of Mexico for 150 combined iron and tubular braces, to be used in the construction of sewers in that city.

The Union Akron Cement Co., Buffalo, N. Y., secured contracts for furnishing the Akron star brand cement for use in the construction of several new buildings in Buffalo recently.

The Asphalt Construction Co., Jersey City, N. J., has been incorporated to dig, mine and purchase crude asphalt and to manufacture the refined asphalt for paving and other purposes. The incorporators are: William Booth, New London, Conn.; William Kelly, New York City; William S. White, Rockland, Me.; Wolstan R. Brown, Passaic, N. J.

The Vitrified Brick and Tile Co., Coffeyville, Kas., is adding new machinery and making other improvements.

The Diamond Fire Clay Co., the Uhrichsville Fire Clay Co., the Buckeye Fire Clay Co., the J. J. Mazurie Tile & Sewer Pipe Works, and the Advance Brick Works, all

clay industries at Uhrichsville, O., have resumed operations.

D. C. Porter has been made superintendent of the Clinton Paving & Building Brick Company's plant at Clinton, Ind., to succeed Wm. M. Hamilton, who resigned.

The plant of the Table Rock Vitrified Paving Brick Co., at Table Rock, Neb., has been leased by Chas. H. Heineman of Falls City, who will place it in operation at once under the supervision of Geo. F. Cotton.

G. B. Boren of Steubenville, O., has purchased an interest in a paving brick plant at Catskill, N. Y., and has resigned his position as manager of the Mack Manufacturing Co. in order to devote his entire time to the management of the new plant.

The New York Brick & Paving Co., Syracuse, N. Y., resumed operations April 1.

The Canton-Cleveland Brick Co., Canton, O., has elected officers as follows: President, F. B. Many, Cleveland; vice-president, H. S. Belden; secretary and treasurer, J. L. Higley; superintendent, Peter Miller.

The Eclipse Paving Brick Works, at Hubbard, O., have been sold to Susannah Hiscock, of Warren, O., for $5,667. The plant was constructed a few years ago at a cost of about $15,000. The sale of the plant is the result of litigation.

An effort will be made to secure an appropriation with which to purchase a stone crusher at Leominster, Mass.

The purchase of a 15-ton steam road roller, a stone crusher, engine, etc., for road building, is contemplated at Oyster Bay (L. I.), N. Y.

The board of aldermen at Lawrence, Mass., voted, April 12, to transfer $3,800 for the purchase of a stone crusher.

The Assyrian Asphalt Co., Chicago, Ill., has certified to an increase in capital stock from $250,000 to $456,000.

D. F. Lane has begun the erection of a plant for the manufacture of steel bridges, at Painted Post, N. Y.

The purchase of a street sweeper is contemplated at Creston, Ia. Mayor Niemeyer.

The town council of Cumberland, R. I., has under discussion the proposed purchase of a steam road roller.

Press reports state that a street sprinkler is needed at South Ottumwa, Ia.

The question of purchasing a stone crusher and elevator is under discussion at Beach Creek, Pa. Joseph Hubbard is interested.

The Rochester Water Co. has been organized at Portland, Me., to manufacture machinery for water works. The officers of the company are: President, James C. Fox; treasurer, Harry M. Verrill.

The Excelsior Artesian Well & Sewerage Co. has been organized at Wilmington, N. C., to put in artesian wells, sewerage and water works systems. The officers of the company are: President, William E. Worth; vice-president, George H. Locey; general sperintendent, Charles H. Leach; secretary and treasurer, F. H. Stedman; general counsel, John D. Bellamy.

The select and common councils at Lancaster, Pa., have under discussion the purchase of one street sweeper and four sprinkling wagons. The finance committee has been directed to ascertain the cost of same prior to the May meeting of councils.

The board of public works, Everett, Mass., voted to purchase three new watering carts, but the order appropriating $2,000 for the purchase was defeated by the board of aldermen.

The Adams Water Co. has been formed, at Bangor, Me., for the purpose of purchasing, owning and maintaining the water works system of Adams, N. Y. The officers of the company are: President, John Littlefield, Brewer; treasurer, F. H. C. Reynolds, Boston.

A. J. Wellington of Newton, Mass., has purchased land at North Stoughton, Mass., with the purpose of establishing a stone crushing business.

The town of Moravia, N. Y., contemplates the purchase of a crushed stone roller.

The sum of $250 has been voted for a road machine at Sherman, Me., C. A. Robinson, selectman.

The purchase of a stone crusher has been favorably voted on at Warren, R. I.

A petition has been presented to the board of trustees, at Albion, N. Y., asking that a steam road roller be purchased.

The board of trustees, Aurora, N. Y., have in contemplation the purchase of a steam road roller and stone crusher.

The Wrought Iron Bridge Co. of Canton, O., is making the iron work for the lighthouse at Northhead Point, Washington.

John L. Galt was appointed receiver of the Continental Asphalt Company at Ardmore, I. T., April 14. The receiver is empowered, after the execution of a bond of $20,000, to continue business.

The city of Winona, Minn., is in need of a steam road roller. Alderman Stott is interested.

Recent press reports from Binghamton, N. Y., stated that if certain streets were macadamized in that city one or more stone crushers and a heavy roller would be needed.

The purchase of a portable rock crusher committee of the board of trade recently at Nevada, Cal. President Zeitlen.

W. L. Palmer, selectman at West Medway, Mass., advocates the purchase of a stone crusher and engine for that town at an estimated cost of $1,500.

The purchase of another steam road roller, at an estimated cost of $3,250, is advised at Springfield, Mass.

The committee of highways at Newport, R. I., voted recently to purchase a new four-wheel dump cart. Alderman Healey is interested.

Ex-Alderman Henry P. Burgard, Buffalo, N. Y., is said to be interested in the formation of a new paving company to operate in that city. He has been conferring with W. T. Barton and Charles I. Williams, of Utica, who handle the Alcatraz asphalt, with this end in view, but no decision has yet been reached.

P. F. Mahan, Walter Burke and H. B. May have been appointed a committee, at Natick, Mass., to investigate the condition of the stone crusher and decide whether it can be repaired, or if the purchase of a new portable crusher will be necessary.

E. D. Wighton, who was appointed receiver of the Sioux City Sewer Pipe Co., Sioux City, Ia., April 13, will commence the manufacture of paving brick within a very short time.

The death of J. B. Clements effected the reorganization of the Christy Fire Clay Co., which is as follows: President, Calvin M. Christy; vice-president, Chas. T. Farrar; general manager and treasurer, W. C. Nor-

ris; secretary, Franklin P. Jones; assistant secretary, R. D. Hatton.

George W. Reed, Abbeville, Ga., is said to have in contemplation the purchase of brick machinery.

The plant, land and mineral rights of the Royal Clay Mfg. Co., Uhrichsville, O., will be offered for sale May 1, by Jas. M. Cooper, receiver.

The Calumet Clay Company, the Ohio Valley Clay Company and the Forest City Sewer Pipe Works, at Toronto, O., have resumed operations.

The Empire Fire Clay Co., Empire, O., resumed operations April 1. The Freeman Company has started its plant also.

The Iowa Pipe and Tile Company of Des Moines, Ia., recently appeared before the board of equalization and asked that the assessment of $10,000 for capital employed in manufacture be cancelled. The request was refused and the company appealed to the district court, when it was found that the petitioner and appellant was liable to assessment in the sum of $1,050 and no more, and it was ordered that the original assessment be reduced to that amount. The board of equalization appealed to the supreme court. The question to be decided was whether or not the appellee should be assessed as a manufacturer or a merchant and the supreme court holds that the appellee is liable to assessment for taxation as a manufacturer only.

The Standard Paving Company went back in the hands of the old officers of the Buffalo Paving Company, Buffalo, N. Y., April 20, as follows: President and general manager, John Miller; vice-president, Mathias Rohr; treasurer, George Sandrock; secretary, William H. Dolan; directors, Richard C. Osterhout, Andrew F. West and John H. Perrine. E. C. Shaffer, Frank J. Illig and Henry P. Burgard have severed their connection with the company.

Bids will be received May 4, for a street sweeper, at Amsterdam, N. Y. F. E. Crane, city engineer.

The superintendent of streets, at Putnam, Conn., has been authorized to purchase three carts, a new road machine, a plow and miscellaneous tools. Mayor Smith.

The street committee at Warren, Pa., has been authorized to purchase a street sweeper at a cost of $325.

The purchase of a first-class asphalt plant has been suggested at Newport, R. I., as a means of saving the city many thousands of dollars in the care of the highways and on constructing roads.

The purchase of a street sprinkler is urged by the citizens of Webb City, Mo.

The proposed purchase of a steam road roller is under consideration at Laconia, N. H. William I. Nelson, city engineer.

P. C. Powers, street commissioner at Memphis, Tenn., has recommended to the council that an additional street sweeper be purchased.

The O. S. Kelly Company, Springfield, O., was awarded the contract for furnishing a fourteen-ton steam road roller to the city of Waukesha, Wis.

W. L. Glazier, city engineer at Newport, Ky., says that a road roller will be purchased next year.

Bids were received April 7 at Oroville, Cal., for furnishing the board of supervisors a rock-crushing plant as follows: James Porteous, Fresno, Cal., roller, 5 tons, $600; W. S. Godwin & Co., Philadelphia, rock crusher, 9x15, $600 and $900; J. Hendy Machine Works, S. San Francisco, complete plant, $1,575; Gates Iron Works, Chicago, rock crusher, $700 and $800, elevator, $6 a foot, screen, $125, roller, $500; L. E. Hoyt & Co., Walton, N. Y., rock crusher No. 1, $475, No. 2, $650, elevator, $125, screen, $120; Pelton Water Wheel Co., San Francisco, plan A, $2,060, complete, plan B, $2,650, plan C, $2,460; Henshaw, Bulkley & Belcher, San Francisco, rock crusher, $1,050, elevator, $150, screen, $187, roller, $510, complete, $1,897; J. W. Turner, S. San Francisco, rock crusher No. 1, $525, No. 2, $675, elevator, No. 1, $126, No. 2, $160, screen, $125, roller, $450, No. 1, complete, $1,226, No. 2, complete, $1,410.

Asphaltum has been found near Miami, I. T. H. S. Mitchell, superintendent of the Memphis road is in receipt of some specimens of the asphaltum.

The Central Union Sewer Pipe Trust was organized at Cleveland, O., April 22, by forty-five firms in Ohio, Pennsylvania, New York and West Virgina, embracing practically the entire sewer pipe manufacturing district.

The O. S. Kelly Co., Springfield, O., secured the contract for supplying Oakland, Cal., with a steam roller for $3,950.

Bids have been ordered for the purchase of a street sweeper at Grand Rapids, Mich. Frank D. Warren, city clerk.

RECENT INVENTIONS.

[Reported specially for MUNICIPAL ENGINEERING, by A. I. Gardner, Attorney at Law and Solicitor of Patents, Loan and Trust Building, Washington, D. C. Copies of any patent can be secured for ten cents each.]

579,963. Sewer-Gas Trap. F. E. Cudell, Cleveland, O. In combination a chamber having caps, a vertical angular inlet pipe attached to the upper side and an angular outlet pipe attached to the under side of said chamber, said pipes lapping inside of the chamber.

580,128. Street Sweeper. Henry Glanzer, Dayton, O.

580,701. Cross Walk for Streets. Peter McMenamin, Jersey City, N. J. A wear-plate for the joint of bridge or cross-walk stones adapted to span over said joint and bear upon the upper side of said stones, said plate having tie-rods passing through said joint, each provided with a pivoted arm adapted to span under said joint and bear upon the under side of the stones.

580,700. Sewer-Gas Trap. Henry McEvoy, New York, N. Y.

580,793. Apparatus for Treating Sewage. G. D. Mitchell, Chelsea, Mass.

580,460. Street Sweeper. N. B. Miller and F. Mohle, Omaha, Neb.

580,603. Street Sweeper. O. A. Logan and F. W. Wright, New York, N. Y.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Northampton, Mass.—The purchase of a portable stone crusher at a cost not to exceed $2,000 has been authorized.

Buffalo, N. Y.—The plan of exacting a ten-year instead of a five-year guarantee from the paving companies is proposed.

Evanston, Ill.—(Special.)—C. L. Williams, acting Commissioner of Public Works, says the contract for paving Crain street was not let, but deferred for another year.

Terre Haute, Ind.—The Warren-Scharf Asphalt company began the work of paving with asphalt Ohio street, from First to Ninth and One-half, April 14.

Niagara Falls, N. Y.—The paving injunction suit which has been heard before Referee Lewis from time to time since February 26 has been adjourned until May 4.

Newark, N. J.—Mayor Seymour and the board of public works have admitted to competition four kinds of asphalt—Trinidad Pitch Lake, Bermudez, Sicilian and Alcatraz.

Scranton, Pa.—(Special.)—This city is discussing the question of erecting a plant at a cost of $700, by which the city would be enabled to repair its asphalt paved streets.

Denver, Col.—The Barber Asphalt Paving company is about ready to begin tearing up the present asphalt paving around the capitol grounds and constructing a 1-inch layer where one-half inch is now laid.

Chicago, Ill.—The Wisconsin legislative committee made an adverse report on the Sheridan drive bill, declaring that the construction of a boulevard from Milwaukee to the state line to connect with the one built from Chicago was not feasible.

Atlanta, Ga.—The street committee has postponed the awarding of the contract for paving Forsyth street owing to residents of the street being unable to agree upon the same material. Asphalt, brick and wooden blocks are the materials being advocated.

Middletown, O.—An injunction has been issued against the councilmen to prevent them from awarding the contract for paving a portion of Main street to Adams Bros. of Zanesville, by R. N. Andrews, who claims he is the lowest and best bidder for the work.

Allegheny, Pa.—A Citizens' Municipal League has been organized to make a complete investigation of the asphalt question. James Hay is chairman of the league and J. K. Miller and John Schreiner are members of the committee appointed to make the investigation.

Baltimore, Md.—A systematic inspection of the streets by the city commissioner's department and reports received through the police department have located about 720 holes of various sizes in the street beds. Commissioner Hanway says $300,000 will be needed for repairs.

Los Angeles, Cal.—A repetition of the recent controversy over the Main street paving will be guarded against by City Engineer Dockweiler preparing specifications prescribing materials and the chemical tests to which they should be subjected. The specifications are modeled on the terms of the contract drawn by the United States engineers for the paving of Presidio, at San Francisco.

Allegheny, Pa.—(Special.)—At a meeting of the Public Works Committee, April 12, 1897, the report of the Street Commission on the streets selected to be paved under the new street act, and paid for out of the bond issue, was received. On all streets on which there are street car tracks they recommended that the street be paved only from curb to curb to within one foot of the outer rails, leaving the remainder to be done by the street car companies. They also recommended new sewers in several streets before paving. The report was adopted. It includes some thirty items for street paving.

CONTEMPLATED WORK.

Pepperell, Mass.—The construction of a macadam road is contemplated.

Riverside, Cal.—W. Eighth street will be macadamized.

Westfield, Mass.—About $2,500 will be expended for concrete walks this year.

Waterville, Ga.—Paving is proposed for Main street, from Temple to College avenue.

Troy, N. Y.—Brick paving is contemplated for Pine Woods avenue.

Burlington, Ia.—The council has ordered Third, Fifth and Valley streets paved.

Norfolk, Va.—Belgian block paving is proposed for Chapel street, from Charlotte to Wood.

Providence, R. I.—The common council has been asked to appropriate $200,000 for highways.

Jamestown, N. Y.—Petitions are being circulated for paving on E. Second and N. Main streets.

Portland, Me.—Granite block paving is contemplated from Centre street, from Free to Fore.

Chicago, Ill.—The South Park Commissioners contemplate paving Michigan boulevard with asphalt.

Akron, O.—A resolution has been passed to pave Howard street, from Main to Talmadge street, with asphalt.

Allegheny, Pa.—The public works committee has recommended repaving for a large list of streets this year.

Tottenville (S. I.), N. Y.—Several streets will be macadamized under the supervision of the county engineer.

Boston, Mass.—Macadamizing is contemplated for Seventh, First, K, Third and O streets in South Boston.

Annapolis, Md.—An ordinance has been prepared to bond the city for $37,000 to repair Main street.

Athens, Ga.—College avenue, from Clayton street to Hancock avenue, will be macadamized.

Malden, Mass.—An order has passed the council appropriating $10,000 for brick sidewalks and edgestones.

Chattanooga, Tenn.—Poplar street will, according to report, be paved with asphalt.

Logansport, Ind.—(Special.)—A. H. McDonald says that asphalt paving is being talked of for North street.

Buffalo, N. Y.—The common council contemplates appropriating $25,000 for the improvement of Niagara Square.

Medford, Mass.—(Special.)—T. Howard Barnes, city engineer, says the main thoroughfares will be paved with macadam.

Detroit, Mich.—Asphalt repaving is proposed for Jefferson avenue, between Mt. Elliott avenue and Belle Isle bridge.

Lancaster, Pa.—Petitions have been received for macadam paving for Orange, Park, New, Shippen and other streets.

Ft. Wayne, Ind.—A petition is being circulated for brick paving in High street, from Wells street to St. Marys avenue.

Newton, Ia.—The question of paving the principal streets is being discussed by the Business Men's association.

Cranston, R. I.—A resolution appropriating $10,000 for repairing, mending and laying out of highways has been passed.

Berkeley, Cal.—Wheeler street, from Prince to Russell, and a portion of Harper street will probably be macadamized.

Youngstown, O.—Definite steps have been taken toward securing a limestone turnpike from this city to the Ohio river.

Northampton, Mass.—The highway committee has decided to macadamize Center street. Superintendent Dayton has prepared estimates.

Elizabeth, Pa.—The proposition to borrow money to pave the principal streets will be submitted to a vote of the people.

Amsterdam, N. Y.—(Special.)—F. E. Crane, city engineer, says that about three miles of macadam paving will be laid this season.

Springfield, Mass.—The vitrified brick paving on Main street will be extended to Locust street. Bids will be advertised for soon.

Pittsfield, Mass.—(Special.—A. W. French, clerk B. P. W., says Waconah and South streets will be paved with macadam at a cost of $7,000.

Washington, P'a.—The borough council contemplates expending $60,000 for street paving this year. Brick will probably be the material laid.

Jersey City, N. J.—Plans and estimates are being made by Edlow W. Harrison, county engineer, for the new West Hudson boulevards.

Bethlehem, Pa.—The citizens will vote on the proposition to issue $75,000 for the purpose of macadamizing every street in the borough.

Taunton, Mass.—(Special.)—Luther Dean, city engineer, says that $35,000 has been appropriated for new street work and $10,000 for new sidewalks.

Hagerstown, Md.—(Special.)—James E. S. Pryor says that W. Washington and S. Potomac streets will probably be paved with brick during the summer.

Milwaukee, Wis.—The board of public works has recommended that Summit Place, from Burleigh street to Hartford avenue, be paved with asphalt.

Iowa City, Ia.—Plans and estimates are being made by the city engineer for paving with brick and curbing Clinton street from Jefferson to Church street.

Passaic, N. J.—(Special.)—Colin Reed Wise, city surveyor, says that 5,400 square yards of macadam paving will be constructed in Meade avenue in June.

Atlantic City, N. J.—(Special.)—The council has passed an ordinance for the paving of Pacific avenue at a cost of $50,000.

Quincy, Ill.—(Special.)—E. R. Chatten, city engineer, says that 48,254 square yards of brick paving on stone foundation, is contemplated, at a cost of $69,120.

Port Huron, Mich.—(Special.)—F. F. Rogers, city engineer, says that Military and Water streets, 6,000 square yards, will be paved this summer with brick on concrete.

Keokuk, Ia.—(Special.)—J. M. Walker says that this city may construct about the same amount of macadam paving this year that it did last, 18,000 square yards.

Richmond Hill, (L. I.), N. Y.—The question of issuing $220,000 worth of bonds for paving the sidewalks and macadamizing the streets was favorably voted on April 7.

Macon, Ga.—(Special.)—J. W. Wilcox, city engineer, says that four miles of street will be improved by paving, but it is too soon to give any definite information.

Rock Island, Ill.—(Special.)—W. A. Darling, city engineer, says there will probably be some brick paving on macadam foundation, although the city council has not yet provided for it.

Rockford, Ill.—(Special.)—Charles C. Stowell, city engineer, says that West street, 8,000 square yards, and S. Main street, 17,093 square yards, will be paved with brick on a 6-inch rubble foundation.

Mason City, Ia.—(Special.)—This city has decided to pave six or seven blocks of Main street with either asphalt or brick. Asphalt is preferred by the majority of property owners.

Cedar Rapids, Ia.—(Special.)—E. P. Boynton, city engineer, says that brick paving on 6-in. macadam foundation is contemplated, but has not been definitely settled upon yet.

Holyoke, Mass.—The board of public works has asked for an appropriation of $122,618, of which $10,000 is for paving Cabot street, from Main to East, and $8,500 for street watering.

Detroit, Mich.—(Special.)—The committee on repaving fund estimates will recommend that Park street, from Adams to Peterboro, be paved with asphalt, at a cost of $32,775.

Auburn, N. Y.—(Special.)—D. F. Austin, city surveyor, says that 18,000 square yards of asphalt and brick paving on concrete foundation will be laid in South street; estimated cost, $36,000.

Fall River, Mass.—The committee on construction and repairs at its meeting April 16, recommended sewers, curbing, concreting, crosswalks, etc. The curbing represents many miles.

Lima, O.—(Special.)—L. F. Prevost, city civil engineer, says that 30,000 square yards of W. Market street will be paved with asphalt on concrete at a cost of $35,000. The work will be done in August.

Fitchburg, Mass.—(Special.)—David A. Hartwell, city engineer, says that River and Westminster streets, 8,000 square yards, will be paved with macadam on a gravel foundation at a cost of $6,000.

York, Pa.—Ordinances are being considered for paving Cherry alley, between Philadelphia street and Clark alley, and for macadamizing and guttering Gay alley, between Beaver street and Cherry alley.

Cincinnati, O.—Petitions have been presented to the B. of A. asking for asphalt paving on Spring Grove avenue. Ordinances were passed April 6 for improving six streets.

Cambridge, Mass.—The board of aldermen has made an appropriation of $50,000 for the purchase of land for the proposed 100-foot boulevard which is to run along the Charles river bank to the West Boston bridge.

Susquehanna, Pa.—Paving is proposed for Main street. The estimated cost is about $10,000 and it is proposed to divide the expense equally between the borough, the Main street property-owners and the Erie railroad company.

New Britain, Conn.—Asphalt paving has been recommended for Main street. Petitions are being prepared for macadam paving for a number of streets.

Pittsburg, Pa.—(Special.)—A petition is in circulation and has been signed by the property-owners to have Shetland avenue, from Lincoln to Larimer avenue, and Larimer avenue, from Shetland avenue to the bridge, paved.

Buffalo, N. Y.—(Special.)—Edward B. Guthrie, chief engineer, says that paving is contemplated for 1897 as follows: Asphalt, 154,140 square yard, $378,530.47; brick, 3,175 square yards, $8,700; macadam, 4,546 square yards, $37,100.

Reading, Pa.—A report of April 20 states that councils will probably compromise this city's street paving fight by spending $100,000 for asphalt pavements this year and a like amount for vitrified brick next year.

Sault Ste Marie, Mich.—Paving is contemplated for Spruce avenue, from Johnson street to the depot. While cedar block is advocated there is a difference of opinion regarding the material best suited to the street.

Cincinnati, O.—A petition has been circulated asking that N. Third street, from High street to the old river near the gas works, be paved. The property-owners will ask for the privilege of selecting the material to be used.

Scranton, Pa.—The merchants of Upper Lackawanna avenue are agitating paving for that street, from Washington avenue to Jefferson avenue. Hyde Park avenue, in West Scranton, will probably be paved with brick on sand foundation.

North Adams, Mass.—Preliminary steps are being taken toward securing paved streets. There is a difference of opinion existing regarding material, and granite blocks, brick, and other materials are advocated.

Lowell, Mass.—Supt. Fowler has prepared estimates for contemplated street improvements, among which are the following: Macadamizing S. Whipple st., $3,195; paving Aiken st., from Cheever to Hall, $3,560; paving Charles st., $4,400.

Lafayette, Ind.—(Special.)—W. K. Eldridge says that 1,333 sq. yds. of Columbia street, and 707 sq. yds. of alley will be paved with brick on concrete, and 5,333 sq. yds. of State street, will be paved with macadm on stone foundation.

Pittsburg, Pa.—Plans and estimates have been prepared for stone block paving and repaving in thirty-eight streets, at an estimated cost of $150,000. Grant boulevard, from Center avenue to Forbes street, will be opened, graded and macadamized.

San Jose, Cal.—(Special.)—C. M. Barber, city engineer, says that this city has just passed resolutions to improve about 70 blocks of streets with macadam, 70 blocks with gravel, and about 8 blocks with concrete and bitumen.

New Castle, Pa.—(Special.)—J. H. Miller, ex-city engineer, says that Grant, Croton, Pearson, Cunningham and Long streets, 25,000 sq. yds., will be paved with brick on concrete, and Long avenue 1,300 sq. yds., in gravel, about May 1.

Hornellsville, N. Y.—(Special.)—F. W. Dalrymple, city engineer, says that brick paving on concrete, is contemplated as follows: Canisteo street, 9,000 sq. yds., $18,000; Elm street., 2,200 sq. yds., $2,400. The paving will be done about June 1.

Peoria, Ill.—(Special.)—A. D. Thompson, city engineer, says that Bigelow street, from Columbus avenue to north city limits, 4,042 yds., is to be paved with asphalt 2½ inches thick upon 6-in. of concrete; estimated cost, $11,424.56.

Scranton, Pa.—A resolution was approved April 15 directing City Engineer Phillips to make plans and estimates of both asphalt and brick paving on concrete, for Providence road and N. Main avenue, from Carbon street to Weston Place.

Philadelphia, Pa.—A petition has been circulated in all the principal bicycle clubs, which will be presented to the councils, asking that an ordinance be passed authorizing the placing of asphalt strips on the Walnut street bridge and its approaches.

Newport, Ky.—(Special.)—W. L. Glazier, city engineer, says that Columbia and Third streets, 6,400 square yards, will be paved with brick on 6-inch concrete, and Roberts and German streets, with brick on 12-inch concrete. The work will be done in two or three months.

Kansas City, Mo.—(Special.)—Resolutions were adopted by the council April 9, for paving with Trinidad lake asphalt, the following streets: Eighth street, from Woodland to Olive; Charlotte street, from Sixteenth to Eighteenth; Seventeenth street, from Crane avenue to Oak street.

Denver, Col.—Plans and estimates were adopted April 15, for grading and curbing a number of streets and avenues in Capitol Hill, grading and curbing District No. 2. The board will hear objections against this improvement May 24. The estimated cost is $50,249.

Hamilton, O.—The property owners on Main street, from the bridge to Millville avenue, presented a petition, April 19, for paving for that street. The specifications have been amended so that all kinds of asphalt block may be bid on in the future. The south side of High street, between Second and Riley, will be curbed.

Sioux City, Ia.—(Special.)—L. F. Wakefield, city engineer, says that this city has in contemplation the following paving: Asphalt, on 6-inch concrete foundation, Pearl, Pierce and Sixth streets, 21,000 square yards, $50,000; brick, on 6-inch concrete foundation, Fifth, Nebraska and W. Seventh street, 50,000 square yards, $80,000.

Rochester, N. Y.—Asphalt paving has been proposed for Rogers avenue, from Otis to Lois, and Warner and Myrtle streets, from Otis to Lyell avenue. Ordinances have been prepared for an asphalt pavement and sewer in Bronson avenue, from York to Genessee street, estimated cost, $5,100; asphalt paving in Lyell avenue, estimated cost, $82,000.

Joliet, Ill.—(Special.)—George N. Brown, city engineer, says that brick paving is contemplated for the spring as follows: On concrete, Washington street, 13,000 square yards, $18,850; two course brick, Jefferson street, 9,500 square yards, $13,300; on concrete, Van Buren street, 3,500 square yards, $4,725; on concrete, Clinton street, 4,800 square yards, $6,480.

Newburyport, Mass.—The highway committee inspected the condition of the streets April 19, in order to decide which should receive attention first. A number of the streets are in bad condition, and the subcommittees have asked that some of them be macadamized, some covered with a layer of crushed stone, gravel, etc.

Binghamton, N. Y.—The city engineer has been directed to prepare and file with the city clerk, specification for paving Washington street, from the terminus of the present pavement to Lewis street, with Trinidad lake, Bermudez, Sicilian, or German Rock asphalt, on hydraulic cement concrete foundation, and for a five or ten-year maintenance guarantee.

Toledo, O.—Resolutions have been adopted for paving with Trinidad Pitch lake asphalt or vitrified blocks Huron street, from Monroe to Washington, and with vitrified blocks, St. Louis street, from Starr avenue to Nevada street. A petition is being circulated for paving Fifth street, and the triangle at the intersection of Fourth street and Starr avenue will soon be paved.

Columbus, O.—(Special.)—Josiah Kinear, chief engineer, says Hamilton avenue and Oak street, 8,000 square yards, will be resurfaced with asphalt during 1897 at a cost of $10,000, and Front, Pearl, Cypress, Hubbard and Neil streets, 35,000 square yards, will be paved with brick at a cost of $50,000.

Jackson, Mich.—(Special.—R. M. Newman, city engineer, says provision has been made in appropriations for brick paving on concrete foundation in Main, Jackson, Pearl, Cooper, Columbus and Milwaukee streets and Park avenue, aggregating 33,000 square yards; estimated cost, $61,000. The work has not yet been ordered.

New Haven, Conn.—A request has been made for paving with brick the intersections at State and Elm, Church and Chapel, Church and Elm, George, Church and Congress avenue and York and Chapel. Also, for hardening sundry streets. The committee on streets voted, April 21, to recommend the construction of sidewalks in several streets, the repair of N. Front street and grading Argyle and Sycamore streets.

Lansingburgh, N. Y.—Village Engineer Hicks has about completed the plans and specifications for the proposed paving of Second avenue. The estimated cost is $125,000. The committee appointed to conduct the preliminary work is composed of trustees Fred M. Hoyt, William Rochester, Richard Greene, Joseph Bowman and William Miter. The advisory board, which will superintend the work generally, consists of M. M. Waterman, William McCullom and Charles H. Daudy.

New Bedford, Mass.—The abutting property owners on Taber street, from Page to Brigham, are undecided whether they want an eighty-foot boulevard or a fifty-foot street. The Board of Public Works has ordered macadam paving in Cottage street, from Grove to Hawthorne, and Grove street, from Ash to Cottage; asphalt walk, curb and paved gutter, east side Sears street, from Washington to Fair; grading, curbing, gutters, flagging and concrete walks in various streets.

Kansas City, Mo.—The property owners on Twenty-ninth street, from Cherry to Troost avenue, have adopted a plan for paving with Trinidad lake asphalt, under the new side street plans, with 28-ft. roadway, granitoid sidewalks and parkways on either side. An ordinance for paving Sixteenth street, from Summit to Broadway, with Trinidad lake asphalt was passed. The Metropolitan company state that it is its purpose to permanently pave between all the tracks this summer.

Brooklyn, N. Y.—(Special.)—N. P. Lewis, engineer of street construction and maintenance, says paving is contemplated as follows: Asphalt on concrete, about forty streets, aggregating about 250,000 square yards, $500,000; brick on concrete, Washington and McClasson avenues, 18,000 square yards, $45,000; macadam, outlying wards, 15,000 square yards, $15,000; granite block on sand, 40,000 square yards, $70,000; granite blocks on concrete, Kent and Tompkins avenues, 17,000 square yards, $47,000.

Altoona, Pa.—(Special.)—Harvey Linton, city engineer, says that it is impossible to predict with any certainty what paving will be done, as paving is done after the citizens owning property abutting in the thoroughfare to be paved have petitioned the city councils for some. The paving that is most probable, however, is as follows: Eleventh alley, between Fourteenth and Fifteenth streets, 667 square yards, and Sixteenth street, between Eleventh and Washington avenues, 3,450 square yards. The paving will probably be vitrified brick on a 6-inch concrete foundation. The only other paving that is likely to be put down is a sort of macadam put down by the street commissioner of broken stone, 6 to 12 inches thick, where improved roadways are most needed.

New York, N. Y.—(Special.)—At a meeting of the board of aldermen March 30, resolutions were passed requesting the commissioner of public works to pave with asphalt, portions of eight streets. The board of aldermen at a meeting held April 13, were petitioned by the property owners to pave One Hundred and Twenty-eighth street, between Park and Madison avenue, with asphalt. Resolutions were passed, April 13, by the board of aldermen, requesting the commissioner of public works to pave with asphalt West End avenue, from Seventy-sixth to Seventy-eighth street, and Lewis street, from Houston to Eighth. The property owners on One Hundred and Thirty-sixth street, between Seventh and Eighth streets, are making an effort to have the street paved with asphalt.

CONTRACTS TO BE LET.

Marietta, O.—Bids will be received until May 3 for paving Butler street with brick.

Muncie, Ind.—Bids are asked until May 17 for paving sundry streets. F. A. Elrod, city clerk.

Orange, N. J.—Bids are asked until May 3 for macadamizing 1,960 square yards of Taylor street.

Concord, Ia.—The contract will be let May 4 for county grading; bond, $500. H. V. Reed, county auditor.

Baltimore, Md.—Bids are asked until May 10 for paving Patterson avenue with asphalt.

Holyoke, Mass.—The board of public works voted, April 12, to advertise for proposals for 3,000 feet of curbing.

Lansdowne, Pa.—Bids will be received until May 6 for constructing artificial stone pavements. H. L. Warren, secretary.

Brooklyn, N. Y.—Bids are asked until May 3 for flagging sidewalks in nine streets. Theo. B. Willis, commissioner city works.

Norwood, O.—Bids will be received until May 8 for macadamizing Stone avenue. W. E. Wichgar, 517 Johnston building, Cincinnati.

Charles City, Ia.—Bids will be received until May 3 for grading, curbing and macadamizing Main or Niell street; check, $500.

Elmira, N. Y.—Sealed proposals will be received until May 3 for paving N. Church street, from Walnut to Hoffman, with asphalt on concrete and for curbing and resetting or renewing old curb. Thos. Spence, clerk board of public works.

Indianapolis, Ind.—Bids are asked until May 3 for repairing asphalt pavements and for furnishing about 400,000 paving brick. M. A. Downing, president board public works.

Bradford, Pa.—Sealed proposals will be received until May 3 for about 18,000 square yards of brick paving in three streets; certified check, $300. Jos. A. Lindsey, city clerk.

Sharpsburg, Pa.—Sealed proposals will be received until May 4 for repairing with vitrified brick Clay and N. Canal streets. E. C. Hurlburt, boro' engineer.

Lancaster, O.—Sealed proposals will be received until May 15 for paving Main street, from Broad to Maple, with vitrified brick. H. T. Mechling, city clerk.

Central City, Neb.—Sealed proposals will be received until May 18 for grading 800 rods, more or less, of roads in Vieregg township. Chas. Scherzberg, Jr., clerk.

Brooklyn, N. Y.—Bids are asked until May 5 for paving several streets with granite blocks and for asphalt strips on each side of Bushwick avenue. Theo. B. Willis, commissioner city works.

South Bend, Ind.—Sealed proposals will be received until May 10 for paving with brick and curbing with cement Michigan avenue, Walnut street and Lamont terrace. L. A. Hull, city clerk.

Tamaqua, Pa.—Sealed proposals will be received until May 5 for curbing, paving and guttering side and foot walks for the remainder of the year 1897. Daniel Bauer, chief burgess.

Marshalltown, Ia.—Sealed bids will be received until May 10 for grading, curbing and paving as follows: Brick paving, 34,000 square yards; curbing, 15,600 lineal feet; check, $1,000. J. G. Trotter, city clerk.

Meridian, Miss.—(Special.)—Sealed proposals will be received until May 7 for 15,000 square yards of vitrified brick paving on concrete foundation, and 30,000 square yards of chert paving. I. A. Mooser, city clerk.

Washington, D. C.—Sealed proposals will be received until May 10 for furnishing supplies for the fiscal year, which include sand, gravel, lime, cement and brick. Theo. A. Bingham, colonel U. S. Army.

Hartford, Conn.—Sealed proposals will be received until May 5 for laying about 17,000 square yards of Trinidad pitch lake asphalt, or other asphalt equal thereto in quality. Charles H. Northam, president board street commissioners.

Cleveland, O.—Sealed proposals will be received until May 12 for improving the lower Cleveland road in Chagrin township and the low level bridge across the same river; bond, $1,000. J. K. Dorn, clerk county commissioners.

Middletown, Ind.—Sealed bids will be rereceived until May 10 for grading and graveling the roadway and grading, gaveling and curbing the sidewalks of Cottage avenue, from Tenth to Fifteenth street. J. W. Farrell, clerk.

New York, N. Y.—Bids are asked until May 4 for preparing and paving the newly-made land in the vicinity of pier 13, North River, with granite or Staten Island syenite blocks, laying cross walks and constructing the necessary sewers and appurtenances. George S. Terry, secretary department docks, pier A.

Butler, Pa.—Sealed proposals will be received until May 4 for grading, curbing and paving with brick, asphalt block, Ligonier block or sheet asphalt, W. Cunningham street, from Main to Chestnut; E. Wayne street, from Main to McKean; Center avenue, from the P. & W. railroad to McKean street. Certified check, $1,000. H. E. Coulter, secretary town council.

Oswego, N. Y.—Sealed proposals will be received until May 3 for Trinidad pitch lake asphalt, Bermudez or Sicilian and German rock asphalt in E. First and W. Second streets, and for repressed vitrified brick paving in W. Second street. Estimated area, 19,263 square yards asphalt paving and 5,568 square yards brick paving. E. A. Cooke, clerk.

Albany, N. Y.—(Special.)—Bids will be received until May 13 for excavating, filling, forming, curbing, repairing and completing the sidewalks, completing the house drains and paving with asphalt paving blocks First street, from Judson to Quail. Bids are also asked for paving four streets with vitrified paving brick. Thomas J. Lanahan, clerk.

CONTRACTS AWARDED.

York, Pa.—J. U. Fritchey of Lancaster, Pa., secured the contract for $200,000 worth of paving April 19.

Chicago, Ill.—The Bermudez Asphalt company secured the contract for paving Jackson street with asphalt.

Harrisburg, Pa.—The contract for furnishing and laying asphalt block crossings was awarded to Charles Fisher at $2.10 a square yard.

Kokomo, Ind.—W. F. Ruddell secured the contract for constructing 17,000 feet of cement sidewalks around the court house at 20 cents a foot.

Long Island City, L. I.—The contract for macadamizing the old Roackway road, five miles, was awarded to Lawrence, Smith & Co., for $51,125.

Kansas City, Mo.—The R. J. Boyd Paving & Constructing company secured the contract, April 15, for paving two streets with vitrified brick, for $7,277.

Whitestone (L. I.), N. Y.—The contract for macadamizing the remainder of the streets under the $50,000 appropriation, was awarded to Peace Bros., April 13, for $30,076.

Belleville, Ill.—The contract for the construction of brick paving on N. Illinois

street was awarded April 5 to ex-Alderman Fred Daab for $6,515.31. Wabash brick will be used.

Franklin, Pa.—The contract for about 7,954 square yards of brick paving and about 2,600 feet of 18 to 24-in. sewer, was awarded, April 18, to Hite & Co. of Clearfield, Pa., for $13,439.

Boston, Mass.—Bids were received April 20 for surfacing the Mystic Valley Driveway in Medford and Winchester, about two miles in length, but the awarding of the contract was deferred.

Logansport, Ind.—(Special.)—A. H. McDonald says that the contract for constructing 43,926 square yards of brick paving on crushed stone foundation on Court street was awarded April 19 to Lux & Talbott.

Butler, Pa.—The contracts for paving Washington and N. McKean streets have been awarded to Peter Schneck, and S. McKean street to George Shaffner. The contracts amount to $31,000.

Springfield, Mass.—J. S. Lane & Sons, of Westfield and Meriden, Conn., were awarded the contract for furnishing 15,000 tons, more or less, of macadam for the ensuing year, at 90 cents, $1.10 and $1.05 a ton.

Kenosha, Wis.—(Special.)—The contract for paving Prairie avenue, from Park street to the western city limits, was awarded to A. E. Rutledge & Co., of Rockford, Ill., at the following prices: Brick, $1.14 a square yard; new sandstone curbing, 42 cents a lineal foot.

Meriden, Conn.—The contract for paving Hanover street was awarded April 12 to C. W. Blakeslee & Son, of New Haven, at $2.27 a square yard for Mack wire-cut brick. The work includes 4,100 square yards of paving, 1,500 feet of new curb and 440 feet of old curb to be reset.

Waverly, Ia.—(Special.)—D. A. Long, city clerk, says the contract was awarded April 6 to William Horrabin, of Des Moines, for paving Bremen avenue at the following: prices: Des Moines brick, $1.03 a square yard; excavating, 23 cents a cubic yard; new curb, 36 cents a lineal foot.

Peoria, Ill.—(Special.)—A. D. Thompson, city engineer, says the contract for furnishing 2,000 lineal feet of 4x20 inch curbing was awarded April 6 to David L. Secrest, of Laurel, Ind., at 25 cents a lineal foot, and 100 feet of 4x20 inch corners, five feet radius, at 45 cents a lineal foot.

Montpelier, Ind.—(Special.)—J. F. Jones, city clerk, says W. H. Merrigold, Lima, O., was awarded the contract March 26 for paving High street with cedar block and cement walks at $8.25 a lineal foot, for 1,350 feet of thirty-foot roadway and cement walks five feet wide, both sides of the street.

Roslyn (L. I.), N. Y.—The contract was awarded April 17 for macadamizing the Manhassett-Port Washington road to S. L. Hewlett and William Titus, of this place, at $1.09 a lineal foot, including grading, etc. The contracts for the Jericho road was not awarded, as the bids exceeded the appropriation.

Jersey City, N. J.—(Special.)—Bids were received April 12 for asphalt paving in Bentley avenue and Magnolia street as follows: California Asphalt Company, $2.30 a square yard; Barber Asphalt Paving Company, $2.10; Henry & McGivney, $2.03; William Williams, $1.74. The contract was not awarded.

Waukesha, Wis.—(Special.)—Wm. Powrie, city engineer, says the contract for paving Grand avenue with brick, from Broadway to C. N. W. R. R., 7,400 square yards, was awarded, April 12, to Cape & Cahill, at $1.26 a square yard for brick on concrete, 26 cents for excavation and 39 cents a cubic yard for new curb. Galesburg brick will be used.

Annapolis, Md.—(Special.)—John H. Bright, chairman street commissioners, says that the contract was awarded, April 8, for paving Cornhill street, and the intersection at Market street, to William E. Feldmeyer, as a whole, at $1,817. The work consists of between 1,300 and 1,400 square yards of rubble stone paving and about 1,200 feet of curbing.

Crawfordsville, Ind.—(Special.)—F. Hoffman, city engineer, says the contract for paving an alley between Main and Market streets, from Green to Washington, with brick, was awarded, April 12, to Henry Clements, at $1.49 a lineal foot, including four-inch concrete foundation and 3x12-inch curb. W. P. Stewart bid $1.66 and Ira McConnell, $1.62.

Jamaica (L. I.), N. Y.—The contract for macadamizing 50 miles of county roads was awarded to Twombley & Eldert of this place at the following prices: Earth excavation, 15 cents a cubic yard; macadam, Class A, 63 cents a cubic yard; class B, 75 cents; class D, 93 cents; iron pipe culverts, 25 cents per lb; cobble gutters, 50 cents a square yard; trap basins, $60 each.

St. Louis, Mo.—The lowest bidders, April 18, for street improvements were as follows: Brick paving in six alleys, H. Ruecking & Co.; four alleys, L. A. Mauk; telford paving in Ohio avenue, John A. Lohrum, $8,408.47; telford paving in Nebraska avenue, G. Eyerman, jr., $4,098.40; vitrified brick, N. Market street, St. Louis Stone Masons' Quarry and Building Association, $7,182.50.

Far Rockaway (L. I.), N. Y.—The contract for improving the streets under the appropriation of $85,000 by laying complete three kinds of pavement, was awarded, April 10, to Edward Roche at the following prices: Brick, $2.45 a square yard; macadam, 97 cents, Roa Hook gravel, 39 cents; total, $97,226.44. The work includes about 7,600 square yards of brick paving, 16,000 square yards of macadam and 152,000 square yards of gravel.

Havana, Cuba.—The contract for grading and paving with granite, asphalt and Belgian blocks, constructing over 100 miles of vitrified brick and cast-iron sewers and other extensive public work, has been awarded to M. J. Dady of Brooklyn, N. Y., for $11,889,250. The work will require the services of about 5,000 men. Work on the contract will begin in November, 1897, and must be completed within five years.

Newark, N. J.—Contracts were awarded April 7, as follows: Telfordizing S. Orange avenue, from the Rahway drive, Millburn to Cheapside, a distance of three miles, James Pierce of Millburn, 62 2-9 cents a lineal foot; excavating, 25 cents a cubic foot; supplying crushed stone for macadamizing Frelinghuysen avenue, Mountain View Quarry Company, $1.44 per net ton; crushed stone for Springfield avenue, South Orange township, C. Lightbipe & Son, $1.25 per net ton.

Olean, N. Y.—Bids were received April 15 for about 10,560 square yards of vitrified brick paving, in Union street. The bids (a, 4-in., and b, 5-in. curb), were as follows: W. H. Simpson, Olean, N. Y., a $21,514.90, b $21,-

541.90; Jamestown Construction Company, Jamestown, N. Y., a $21,404.30, b $21,583.50; W. H. Mandeville & Co., Olean, N. Y., a $21,289.20, b $21,295.20; Eugene Fee, Olean, N. Y., a $20,959.45, b $21,029.45; Edw. H. Post, Wilkesbarre, Pa., a $19,271.80, b $19,522.80; James McCloud & Co., Williamsport, Pa., a $17,864.50, b $17,978.50.

Denver, Col.—(Special.)—Wm. H. Taylor, secretary of the Board of Public Works, says the bids for asphalt and brick paving on the Fourteenth street viaduct, bids for which were received April 8, were rejected and new bids asked until April 21. The bids of John Olsen for sandstone flagging at $1.31 a lineal foot were accepted. The bids for paving were: Asphalt—Colorado Paving Company, $2.31 a square yard; F. O. Blake, $2.25. Brick—J. M. O'Rourke, $2.15; R. P. McDonald, $2.10; Charles Connors, $1.78; Ben Brown, $2.50; F. O. Blake, $1.89.

Albany, N. Y.—T. Henry Dumary secured the contract, April 5, for repaving the Hawk street viaduct, as follows: Brick paving, 1,538 square yards, $1.50 a square yard; brick on concrete, 233 square yards, $2; relaying granite on concrete, 323 square yards, 40 cents; credit wooden block pavement, $132; old granite blocks, $233; total, $2,537. Mr. Dumary secured the contract also, April 19, for paving Jefferson avenue, from Eagle to Delaware avenue, for $19,846.

Louisville, Ky.—Contracts for vitrified brick paving were awarded, April 16, as follows: John Schertzer—First, between Barber and Shipp, $16 per square of 10 ft.; Lee street, between Third and Fourth, $15.50. R. L. Clark, Seventeenth, between Southgate and Lexington, $18. L. R. Figg, alley, $15.50 per square; Anderson street, between Fifteenth and Sixteenth streets, $18. G. W. Gesnell, Griffith, between Twenty-fourth and Twenty-fifth, $19. W. H. Bates, alley, $15.50. M. Lawler & Son, sidewalks, north side of Main street, between Shelby and Logan, 47 cents per square of 10 ft.

Indianapolis, Ind.—Paving contracts were awarded during April as follows: Asphalt—Delaware street, from Twenty-second to Twenty-third, Western Paving and Supply company, $4.83 a lineal foot each side; New York street, from East to Noble, Western Paving and Supply company, $5.13 a lineal foot each side; bids were received for this work April 7, but were rejected as too high; the Western Paving and Supply company's bid at that time, $5.25 a lineal foot, only 12 cents higher than the bid at which they secured the contract. Brick—Alley west of Capitol avenue, from Vermont to Michigan, Capitol Paving and Construction company, $1.38 9-10 a lineal foot each side.

New York, N. Y.—The Barber Asphalt Paving company was awarded contracts April 1 as follows: Fourth street, Second avenue to Broadway, $3.03 a square yard; Thirty-ninth street, First street to Park avenue, $2.97 a square yard; Fifth street, avenue C to D, and Sixth street, avenue B to D, $3.03 a square yard; Eleventh street, avenue D to Second avenue, $3.07 a square yard; Waverly Place, Sixth avenue to Christopher, Christopher, Grove to Waverly Place, $3.39 a square yard.

Napoleon, O.—Bids were received April 3 for grading, curbing and paving with vitrified brick or block Washington street, from Monroe street to Sheffield avenue. The bids ranged in prices as follows: Grading, 8,338 cubic yards, from $1,167.32 to $3,168.44; curbing, 9,000 lineal feet, from $2,321 to $3,619.40; stone and gravel foundation, 3,570 cubic yards, from $2,646 to $3,402; paving block, 14,760 square yards, from $9,741.60 to $15,350.40; filling joints, from $1,171.20 to $3,394.80; inlets, sewers, etc., from $597.25 to $854.50; total bids, from $20,130.88 to $29,056.74. The lowest total bid, $20,130.88, was made by Garrigan & Ryan of Toledo, and the highest, $29,056.74, by T. E. Hill of Defiance.

Brooklyn, N. Y.—N. P. Lewis, engineer of street construction and maintenance, says contracts were awarded March 24 to the Cranford Paving Company as follows: Leonard street, from Greenpoint avenue to Broadway—Asphalt, 97 cents a square yard; foundation, 67 cents a square yard; new curb, 70 cents a lineal foot; reset, 30 cents a lineal foot. Dean street—Asphalt, $1.03; foundation, 70 cents; new curb, 70 cents; reset, 30 cents. Sixteenth street—Asphalt, 97 cents; foundation, 67 cents; new curb, 70 cents; reset, 30 cents. Penn street—Asphalt, $1.07; foundation, 70 cents; new curb, 70 cents; reset, 30 cents. Market street—Asphalt, $1.40; foundation, 75 cents; new curb, 75 cents. The bids for asphalt paving on Leonard and Sixteenth streets amount to $1.64 for the pavement complete, including 6-inch concrete, cost of removing old cobblestone, regrading, etc., and is the lowest bid the city ever received.

Louisville, Ky.—(Special.)—J. Henry Hoertz, secretary board of public works, says contracts were awarded April 7 as follows: Asphalt, Breckenridge Asphalt Paving Company—Breckenridge street, from Brook to Jackson, $22.22 per square of 100 square feet; Kentucky, from Second to Floyd, $22.75 per square of 100 feet. Vitrified brick—J. R. Gleason, Eighteenth street, from Walnut to Chestnut, and from Chestnut to Broadway, and Brook street, from Breckenridge to Caldwell street, $14.40 per square of 100 square feet. Granite, with granite joints—L. R. Fogg, south side Main street, from Eighteenth to Nineteenth; north side Main street, from Fifteenth to Seventeenth street, and Floyd, from Main to Washington, $24 per square of 100 square feet. The asphalt paving bids were $11.11 less per square than in 1894; brick, 80 cents per square less than in 1896; granite, 20 cents per square less than in 1896.

Brooklyn, N. Y.—(Special.)—N. P. Lewis, engineer of street construction and maintenance, says: Bids were opened April 15 for repaving portions of seven streets with asphalt. The prices bid were lower than have ever been named in Brooklyn before. A contract was recently made for repaving Leonard street at 97 cents per square yard for the asphalt pavement and $4 per cubic yard for the concrete, making a finished pavement on a six-inch concrete foundation, with five years' guarantee and including removal of old material and the regulating of the street, cost $1.64 per square yard. The bids received April 15 were 90 cents per square yard for the asphalt wearing surface and $4 for the concrete, making a total of $1.57 per square yard for the pavement complete. These bids were submitted by the Eastern Bermudez Asphalt Co. The next lowest was by Cranford & Co. for Trinidad Pitch Lake asphalt at 97 cents for the asphalt wearing surface and $3.80 for the concrete, or $1.60 per square yard for the finished pavement.

Cleveland, O.—Bids were received April 14 for 24,000 square yards of asphalt paving on Scranton avenue, from Clarke to Pearl; Woodland avenue, from Eagle street to Central avenue; Ontario street, from Lake to Summit; Hamilton, from Bond to Erie; Hickox street, from Euclid avenue to Prospect street. The bids received were as follows: Chas. I. Williams, $2 a square yard for Scranton avenue and Hamilton street, and $2.10, $2.15 and $2.40 respectively for Ontario, Woodland avenue and Hickox street; Claflen Paving Co., $2.24, $2.30, $2.39, $2.49 and $2.45. The other bids on the Scranton avenue contract, which was the best of the lot, were: Mack Paving Co. of Philadelphia, $2.55; the Ohio Bermudez Co., $2.67; Warren-Scharf Asphalt Paving Co., $2.59. These companies' bids on the other contracts were uniformly higher. The contracts for paving Scranton avenue, Hamilton street, Woodland avenue and Ontario street to Chas. I. Williams of Utica, N. Y., and Hickox street to the Claflen Paving Co. Contractor Williams will use Alcatraz asphalt. Contracts for brick paving were awarded, April 16, as follows: Harmon street and Spangler avenue, Raehl Bros., at $6,592.24 and $2,591 respectively; Sumner street and Erie court, Northern Ohio Paving & Construction Co., at $4,180.71 and $3,521.45 respectively; Vine and Brownell streets, M. F. Bramley, at $4,431.37 and $4,288.03 respectively; Luverne street, Claflen Paving Co., $5,695.18.

SEWERS.

New York, N. Y.—The Bronx Valley sewer bill passed the Assembly April 13.

Columbia City, Ind.—Phillips & Goss, Martinsville, Ind., have been engaged to make plans and specifications for fifteen miles of sewers.

CONTRACTS TO BE LET.

Binghamton, N. Y.—(Special.)—H. Ward says that bids are asked until May 10, for constructing a 30x45 inch brick sewer on Lydia street.

Redwood Falls, Minn.—Bids will be received until May 4 for constructing a sewer in Second street; check, $50. Geo. L. Evans, city recorder.

Galesburg, Ill.—Sealed proposals will be received until May 3 for constructing a sewer on Seminary street from Main to Mulberry; certified check, $100.

Cleveland, O.—Sealed proposals will be received until May 5 for the construction of sewers in sundry streets; certified check, $200. George R. Warden, director public works.

Warren, Pa.—Sealed bids will be received until May 5 for the construction of portions of the sewer system for the 5th and 6th wards. D. F. A. Wheelock, borough engineer.

South Bend, Ind.—Sealed proposals will be received until May 10 for the construction of about 2,300 feet of 81-inch brick and about 1,400 feet 18x20-inch pipe sewers. L. A. Hull, city clerk.

Ironton, O.—(Special.)—J. R. C. Brown, city engineer, says that contracts will be let May 5 for 1,330 feet of 30x33 inch brick sewers, 680 feet of 27x30-inch and 3,000 feet of 8 to 15-inch pipe sewers.

Bradford, Pa.—Sealed proposals will be received until May 3 for the construction of a surface sewer on Pearl street, between School and Washington streets; certified check, $100. James A. Lindsay, city clerk.

Cedar Rapids, Ia.—Sealed proposals will be received until May 6 for the construction of sanitary sewers in certain streets and alleys in sewerage districts Nos. 1 and 2, the approximate quantities of which are: 6,764 feet 15, 12, 10, 8, 6 inch pipe sewer; 23 manholes, 33 lampholes, 11 flush tanks; 50,000 brick in specials; certified check, $500. Chas. Weare, E. P. Boynton, board public works.

CONTRACTS AWARDED.

Cincinnati, O.—Henry Wellman was awarded the Bloody Run sewer contract for $36,919.28.

Joplin, Mo.—The contract for constructing a number of sewers was awarded to Matt & Roberts, of Sedalia, Mo., April 21.

Sacramento, Cal.—The contract for operating the sewage disposal plant was awarded March 29 to Campbell & Son for one year for $8,745.

Johnstown, Pa.—The contract for constructing pipe sewers in Main and Bridge streets was awarded to Hite & Co., of Clearfield, for $13,439, April 15.

Belmar, N. J.—A. C. Harrison of this city secured the contract, April 2, for constructing the sewerage system in this city for $19,691.15.

Crawfordsville, Ind.—(Special.)—F. Hoffman, city engineer, says a contract was awarded April 12 for a sewer in the alley between Main and Market, to Henry Clements at 74 cents a lineal foot.

St. Louis, Mo.—(Special.)—B. H. Colby, sewer commissioner, says that the contract for the Hodiamont sewer district, which comprises eight miles of sewers, was awarded April 13 to Anderson Bros. for $91,552.

Niagara Falls, Ont.—Clark & Connolly of Toronto secured the contract April 7 to construct sections 3 and 4 of the sewerage system for $20,064, and A. J. Brown of Toronto sections 5, 6 and 7 for $27,480.

Jamaica (L. I.), N. Y.—Proposals were opened April 19 for the construction of the sewerage system. The bid of James F. Gillen of Brooklyn, $129,806, was found to be the lowest, and the contract will probably be awarded to him.

Rochester, N. Y.—H. N. Cowles secured the Bates street sewer contract for $4,583.10, and H. B. Hooker the Otis street contract for $1,626.10 March 29. On April 2 William H. Jones & Sons were awarded the Brooke avenue sewer for $9,837.

Waukesha, Wis.—(Special.)—Wm. Powrie, city engineer, says August Diemar was awarded contracts April 12 for constructing sewers as follows: Wisconsin avenue, 8-inch vitrified pipe sewer, 35 cents a lineal foot; Barnard and South streets, 8-inch pipe, 45 cents in lineal foot; manholes, $24 each.

Indianapolis, Ind.—Mansfield & Allen secured the contract April 19 for a main sewer in Oriental street, 600 feet, at $1.43 a lineal foot. F. C. Lingenfelter & Co. were awarded the contract for a sewer in Tacoma avenue, from Washington to New York, at $1.11 a lineal foot.

Schnectady, N. Y.—Sewer contracts have been awarded to J. H. Clements as follows: River street, 660 feet, $277.20; Wendell

avenue, 1,000 feet, $700; High street, 450 feet, $175.50; Foster avenue, 280 feet, $361.20; manholes, $25; flush tanks, $55; rock excavations, $1.20 a cubic yard.

New Haven, Conn.—Contracts were awarded April 14 for sewers as follows: A. Brazos & Sons, Main street and Shepard avenue, $2,999.50; Newhall and Ivy streets, $14,353.40; Huntington and Edge Hill road, $3,338. Lorenzi J. Nattie, Goof and Foote streets, $1,133; Clay and Fillmore streets, $1,188. C. W. Blakesless & Son, Stanley street, $1,771.

Frankfort, Ind.—(Special.)—Alonzo J. Hammond, city engineer, says the contract was awarded to Mansfield & Allen of Indianapolis for constructing a sanitary pipe sewer in Clinton and Washington street at the following prices: 10-inch sewer, 50 cents a lineal foot; 8-inch, 40 cents; 6-inch, 32 cents; manholes, $30 each; lampholes, $7; cast iron, 2½ cents.

Sheboygan, Wis.—(Special.)—A. Lutze, chairman board of public works, says bids were received and the contract awarded March 15 to Richard Nommensen for sewer construction as follows: N. Fifth, from Washington court to Pennsylvania avenue, 48-inch steel, $4.50 a lineal foot; N. Fourth, from New York street to Pennsylvania avenue, 48-inch brick, $2.50; 30-inch, $2; Pennsylvania avenue, from Sixth to Third, 24-inch brick, $1.45; 20-inch pipe, $1.10; enter avenue, from Sixth to Fourth street, 18-inch pipe, $1; 12-inch, 60 cents; 10-inch, 55 cents; manholes, $22 each.

Keokuk, Ia.—(Special.)—Leo LeBron, superintendent of sewers, says the contract for extending the north and south branches of the main sewer was awarded April 2 to McManus & Tucker at the following prices: Excavation, 2,950 cubic yards, 24 cents; gravel, 50 cubic yards, 53 cents; sheet piling, 3,000 feet, B. M., $16.20; 6-foot circular sewer, 604 lineal feet, $3.49; egg-shaped sewers—section A, 33 feet, $3.49; B to C, 366 feet, $3.09; D to E, 366 feet, $2.79; F to G, 160 feet, $2.58; 14 manholes, $1.89; 75 6-inch inlets, 16 cents; 12-inch pipe sewer, 250 lineal feet, 33 cents; 30-inch pipe sewer, 25 lineal feet, $1.97; 8-inch pipe sewer, 18 cents; 10-inch pipe sewer, 27 cents.

Champaign, Ill.—(Special.)—C. J. Strahle, city clerk, says that the contract for constructing the sewerage system was awarded to Morgan & Myrick of Morgan Park, Ill., as follows: Trenching and back filling, 6-ft. more or less, 17,380 ft., 9 cents, or $1,564.20; 6 to 8-ft., 46,600 ft., 13 cents, or $6,058; 8 to 10-ft., 35,000 ft., 13½ cents, or $6,475; 10 to 12-ft., 16,400 ft., 25 cents, or $4,100; 12 to 14-ft., 6,800 ft., 31 cents, or $2,108; 14 to 16-ft., 2,500 ft., 38 cents, or $950; 16 to 18-ft., 700 ft., 63 cents, or $41; 18 to 20-ft., 700 ft., 73 cents, or $511; 4,000 ft. 18-in. sewer pipe laid, 29 cents, or $1,160; 1,070 ft. 14-in., 17½ cents, or $187; 3,370 ft., 12-in., 16 cents, or 539; 6,720 ft. 10-in., 12¾ cents, or $856; 73,860 ft., 8-in., 9½ cents, or $7,016.70; 37,060 ft. 6-in., 6¾ cents, or $2,501.55; 20 tons cast iron pipe sewer laid, $27, or $540; 203 manholes, 8-ft. deep, $19, or $3,857; each ft. increase or decrease, $1.50; 90 lampholes, 8-ft. deep, $3, or $270; each ft. increase or decrease, $2.54; 51 flushtanks, $25, or $1.275; total, $40,410.70.

Chicago, Ill.—Sewer contracts have been awarded as follows: Fullerton avenue, N. Fortieth street to N. Forty-sixth street, Thomas Burke, $8,154; Throop street, alleys of Garfield, P., C. & St. L. R. R., William Tobin & Co., $1,176.69; N. Forty-sixth avenue, Wilson-Avondale, Thomas Burke, $2,235.42; Indiana avenue, System-115th street, McNulty & McCarthy, $2,550.50; Monticello avenue, Sixty-fourth-Sixty-sixth, Thomas Burke, Burke, $1,280.20; Hancock street Diversy-Wrightwood, Thomas Burke, $949; Marshfield avenue, Sixty-fourth-Sixty-sixth street, Thomas Burke, $1,092; Eberly avenue, Irving Park boulevard-Montrose, John Hett, $1,857; Southport avenue, Granville-Glenlake, Power & McMahon, $1,105; Kimball, Irving Park boulevard-Montrose, William Tobin & Co., $1,899; Balmoral, Irving Park boulevard-Montrose, McNulty & McCarthy, $1,945; Forty-fifth street, Irving Park boulevard, Thomas Burke, $1,239; Union avenue, Seventy-third-Seventy-fourth street, J. H. H. Roche, $1,142; Avenue M, 102d-104th, William Tobin & Co., $1,322; Avenue S, 102d-104th, William Tobin & Co., $1,332.

Wilmington, Del.—(Special.)—T. Chalkley Hatton says that bids were received March 27, for constructing the Silverbrook sewer, and the contract was awarded to John Jacoby of this city for $37,322.30 for brick sewers and $36,055.20 for concrete sewers.

Cedar Rapids, Ia.—(Special.)—E. P. Boynton, city engineer, says the contract for constructing sewers was awarded, April 15, as follows: Central Park storm sewer, section 1, to Ford & Delahunt—Main trunk, sec. b, $8 a lineal foot; sec. a, $17.50; sec. c, 110 feet, $16.50; catch basin connection, 18-inch pipe, 70 cents; c. b. grates, 3x3 feet, $10; c. b. grates, No. 3, $9; brick specials, $21 per M; manhole covers, $9 each; riprap, $3 a cubic yard; extra concrete, $6 a cubic yard; total, $11,839.50. Section 3, Murray Bros.—Main trunk, sec. b, $9.90 a lineal foot; c. b. con., 18-inch pipe, 75 cents; c. b. grates, 3x3 feet, $16.25; brick specials, $18 per M; manhole covers, $9.50 each; riprap, $2.50 a cubic yard; extra concrete, $3 a cubic yard; earth filling, 25 cents a cubic yard; total, $5,044.80. Eighth street, Bohomy & Wardle—Main trunk, 30-inch pipe, $2.68; main trunk, 36-inch two ring brick, $3.47; 36-inch on ring brick, $1.77; 24-inch pipe, $1.69; c. b. conn., 18-inch pipe, 76 cents; c. b. grates, 3x3 feet, $15; c. b. grates, No. 3, $10; brick specials, $17 per M; manhole covers, $10 each; total, $3,581.10. Thirteenth avenue, west, storm sewers, Ford & Delahunt—New section trunk, $8.90 a lineal foot; rebuilding, $8 a lineal foot; building intake, $100; c. b. conn., 30-inch pipe, $2.50; 24-inch pipe, $1.50; brick specials, $21; 3 c. b. covers, $55; total, $2,544.60. Culvert on First street, West, Bohomy & Wardle—Culvert complete, $1,342; earth filling, 18 cents a cubic yard; extra lumber, $16 per 1,000 feet B. M.; extra concrete, $6 a cubic yard; riprap, $3 a cubic yard.

CONTEMPLATED WORK.

Concord, Mass.—The estimated cost of a sewerage plant is $93,000.

Pawtucket, R. I.—A sewer will be built in Main street, from Broadway to Wolcott street.

Turtle Creek, Pa.—Sewers will be laid on Tenth and Eleventh streets and Airbrake avenue.

Marshalltown, Ia.—The council has voted to construct sewers in W. Main and E. State streets.

Willimantic, Conn.—The sewer committee

has voted to extend the Valley street sewer 330 feet.

Natick, Mass.—An appropriation of $15,000 has been voted for sewer and additional sewer bonds.

Trenton, N. J.—The common council has passed an ordinance authorizing the construction of a sewer in Broad street.

Alexandria, Va.—New sewers have been recommended for King, Cameron and Patrick streets, City Engineer Dunn.

Pittsburg, Kas.—About two miles of pipe sewers are now contemplated for this spring. C. G. Waite, city engineer.

Jamestown, N. Y.—The tax-payers voted, April 3, to extend the sewerage system at a cost of $90,000.

Ackley, Ia.—An 18-inch pipe sewer is being agitated for Cerro Gordo street, from Main street to the creek, 1,500 feet.

Columbus, O.—The establishment of a sewerage system at the Denison university at Granville is contemplated.

St. Joseph, Mo.—A petition is being circulated for the extension of the Black Snake creek sewer.

Lakeland, Ky.—A bill has been passed appropriating $25,000 to perfect the sewerage system at Lakeland asylum.

Asheville, N. C.—(Special.)—B. M. Lee, C. E., says that 3,500 lineal feet of 6-8-10-inch pipe sewer will be built at a cost of $1,300.

Philadelphia, Pa.—Sewers will be constructed in Beechwood, Emlen, Hansberry, Knox, Logan and Manheim streets, Germantown.

Hartford, Conn.—The construction of a sewer is proposed to drain the southwestern portion of the city. C. H. Bunce, city engineer.

New Orleans, La.—Resolutions have been passed by the board of health requesting that the sewerage system be completed at once.

Philadelphia, Pa.—(Special.)—George S. Webster, chief engineer, says that $250,000 will be expended in various kinds of sewers this year.

Jackson, Tenn.—(Special.)—Sam C. Faneasto, city engineer, says that 6,000 lineal feet of 6 to 12-in. pipe sewers will be constructed.

Port Huron, Mich.—(Special.)—F. F. Rogers, city engineer, says that probably two miles of 8 to 12-in. pipe sewers will be constructed.

Fitchburg, Mass.—(Special.)—David A. Hartwell, city engineer, says that about 5,000 lineal feet of 10-12-in. pipe sewer is contemplated.

Richmond, Ind.—(Special.)—H. L. Webber, city engineer, says that 1,200 lineal feet of 9 and 12-in. pipe sewer will be built soon at a cost of $900.

New Castle, Pa.—(Special.)—J. H. Miller, ex-city engineer, says that about one mile of 30 and 24 and 10 and 8-in. pipe sewers will be constructed.

Camden, N. J.—(Special.)—L. E. Farnham, city engineer, says that the work of building 15,000 lineal feet of brick sewer will begin July 1.

Flushing, N. Y.—Plans and specifications have been ordered prepared for sewers and a disposal plant, in Ingleside, Flushing, and Bowne Park district.

Medford, Mass.—(Special.)—T. Howard Barnes, city engineer, says that 10,000 lineal feet of 6-15-in. pipe sewers will be constructed at a cost of $20,000.

Thomasville, Ga.—This city will vote May 20 on the issue of $35,000 6 per cent. bonds to improve the water and sewerage systems and the streets.

Worcester, Mass.—This city has adopted the plans of Thomas M. Drown and Samuel L. Fray for the betterment of the sewerage system; estimated cost, $293,000.

Norwood, O.—A resolution was passed April 12 to construct a sewer in South Norwood at a cost of $40,000, and in Ivanhoe and Wayland avenues at a cost of $15,000.

Sioux City, Ia.—(Special.)—L. F. Wakefield, city engineer, says that 1,600 lineal feet of 15 and 18-inch pipe sewers will be constructed on W. Seventh street at a cost of $2,000.

Elmira, N. Y.—(Special.)—J. E. Rawlins, city engineer, says that about 760 lineal feet of 18-inch pipe sewer will be constructed in Hoffman street, the work to begin June 15.

Grand Rapids, Mich.—(Special.)—George M. Ames, city engineer, says that 5,000 lineal feet of 8-15-inch pipe sewer will be constructed in various streets this season.

Somerville, Mass.—An appropriation of $45,000 has been requested for the construction of a storm water drain from Mystic river to Broadway, thence through Cross to Pearl street.

New Britain, Conn.—An order was passed April 21 to construct the southwest sewer, with laterals, in Winthrop, Wallace, Madison, Kensington and Hart streets.

Waterloo, Ia.—The council has voted to construct a sewer in W. Fifth street and several alleys and to extend the W. Fourth street sewer to Allen street, thence to W. Second street.

Wilmington, Del.—T. Chalkley Hatton, engineer sewer department, is making plans for a new sewer to drain this city west of Scott street and north of Lancaster avenue.

Brooklyn, N. Y.—The board of aldermen has referred to the committee on water and drainage the request for an appropriation of $20,000 for sewer pumping stations 1 and 2.

Lyons, N. Y.—Alexander Potter, Assoc. M. Soc. C. E., is preparing complete plans and specifications for a system of sewers and sewage disposal for this village.

Lowell, Mass.—An appropriation of $75,000 is asked for sewers. The sewer committee voted April 20 to build sewers at once on Westford, Hastings, Oakland, Waugh, Sargent and Wannalanat streets.

Brooklyn, N. Y.—An apropriation of $29,000 has been made for maintenance and ordinary extension of sewers and $35,904 for maintenance and ordinary extension of water works.

Topeka Kas.—The city board of health has recommended to the council that North Topeka sewer be built. City Engineer Barnes has been authorized to prepare plans for the Fensky street sewer.

Dolgeville, N. Y.—Theo. H. Roth, L. E. Lambert, F. J. Loucks, Julius Breckwoldt and E. L. Daniel have been named a sewer commission and will take action in a short time toward securing a sewerage system.

Takoma Park, D. C.—Geo. H. Morgan, city engineer, of Chicago, Ill., has been engaged to make a preliminary survey for the purpose of inaugurating sewerage, water works and electric light plant.

Winooski, Vt.—The construction of a sewerage system is contemplated. A competent engineer will probably be engaged to make a survey of the streets, establish the grade

thereof and to locate a system of sewers.

Lynn, Mass.—The bill authorizing this city to borrow $100,000 for the purpose of constructing the outfall sewer and building other portions of the main sewerage system has been passed by the legislature.

Quincy, Ill.—(Special.)—E. R. Chatten, city engineer, says that 3,950 lineal feet of 2 to 5-foot brick sewers will be constructed at a cost of $16,940, and 921 lineal feet of 8 to 15-inch pipe sewers at a cost of $1,296.

Albany, N. Y.—(Special.)—Horace Andrews, city engineer, says that sewers contemplated are: Washington avenue and Ontario street, 1,200 lineal feet, 4-ft. circular brick sewer; Elm, Grand, Third, Judson, Second and Grant streets, 5,000 lineal feet of 12 to 24-in. pipe sewers.

Jackson, Mich.—(Special.)—R. M. Newman, city engineer, says that sewers will be constructed as follows: Trail street, 1,200 lineal feet 66-in. brick sewer; Detroit street, 1,400 lineal feet 30-in. brick sewer; Pringle avenue, Railroad street, Page avenue and Franklin street, 4,000 lineal feet 12-15-in. pipe sewer.

The construction of sewerage systems is contemplated at the following places: Lexington, Mass.; Fayetteville, Ark.; Tottenville (S. I.) N. Y.; D. C. Butler, village president; Madison, Fla., William S. Jordan, chairman committee; Maquoketa, Ia., C. M. Sanborn, mayor; Menominee, Mich.; Huntsville, Ala.; Rice Lake, Wis.; Fort Ann., N. Y.; Windsor Locks, Conn.

Woonsocket, R. I.—(Special.)—Frank H. Mills, city engineer, says this city will build in the near future about 700 lineal feet of 30-inch brick sewer, 1,030 lineal feet 24-inch pipe sewer and 300 lineal feet of syphon across the Blackstone river. Filter beds will be prepared and a small pumping station erected and equipped with pumps. There will also be built by day labor between two and three miles of sewerage in the streets. The work mentioned will be done by contract.

WATER-WORKS.

Wilkesbarre, Pa.—A municipal water plant is being considered.

Holden, Mass.—The streets are being surveyed for water works.

Toledo, O.—Filtration is proposed for the city water supply. T. R. Cook, Supt.

Orton, Minn.—An appropriation has been asked of Congress for the construction of a reservoir.

Los Angeles, Cal.—City Engineer Dockweiler has prepared a report on a new water works system.

Lebanon, Pa.—Bids will again be advertised for building an additional water supply, to cost $30,000.

Philadelphia, Pa.—The establishment of a filtration plant at the Georgia Hill reservoir is contemplated.

Lancaster, O.—About three miles of extensions of 4 to 14-inch pipe, a new reservoir, hydrants, etc., is contemplated.

Baltimore, Md.—A water purification plant has been recommended for consideration. C. E. Cunningham, Secy. Com. on Water.

Buffalo, N. Y.—The board of public works contemplates advertising for bids for another 30,000,000-gallon pumping engine.

Palouse, Wash.—The construction of a 200,000 gallon reservoir for the water works system is contemplated by the council.

Taunton, Mass.—(Special.)—Luther Dean, city engineer, says that $50,000 has been appropriated for a new pumping engine, etc.

South Bethlehem, Pa.—Bids will probably be asked soon for a 10-year supply of water for fire purposes. Adam Brinker, chrmn.

Eufield, Mass.—A petition to the Legislature asks for a charter for the construction of water works. Chas. Richards, town clerk.

Westchester, Pa.—Plans and specifications are being prepared for a new pumping station; estimated cost, $50,000. B. E. Heston, chairman committee.

Baltimore, Md.—The committee on water has recommended that a special committee be appointed to investigate a system to purify the water supply.

Wauseon, O.—This town will sell soon $22,000 in bonds, the balance of $25,000 voted in 1895 for water works. W. S. Bingham, corporation clerk.

Defiance, O.—The water committee of the council has authorized M. W. Steinberger, city engineer, to prepare estimates for a new water works plant.

Philadelphia, Pa.—An appropriation of $100,000 has been asked with which to build a reservoir of at least 250,000,000 gallons capacity for West Philadelphia.

Lansingburg, N. Y.—The sum of $25,000 has been voted for a new pumping plant of 3,000,000 gallons capacity. The force main line will be 7,000 feet long.

Holly Springs, Miss.—Walter G. Kirkpatrick of Nashville and Canton, Miss., will prepare plans for the construction of water works and electric lights.

Rockford, Ill.—(Special.)—Chas. F. Stowell, city engineer, says that 3,400 lineal feet of 4 and 6-inch water mains will be laid, to replace small mains in various streets.

Pueblo, Col.—The construction of a complete pumping plant and three miles of mains is contemplated by the stockholders of Riverview cemetery. Aaron Sonneborn, secretary.

Troy, N. Y.—The city engineer has been instructed to report any and all feasible methods for increasing the water supply and to investigate the various systems of filtration.

Detroit, Mich.—The water board contemplates building a large brick conduit to replace the sheet iron conduits, between the intake pipe and the settling basin; estimated cost, $100,000.

Meadville, Pa.—Resolutions were passed at a meeting of the citizens, held April 15, that a new water company be formed, with a capital stock of $125,000, for the purpose of constructing a water works system.

Seattle, Wash.—The city engineer and board of public works have been authorized to prepare plans and specifications of the Cedar River water system so as to provide for head works at Cedar river, with a conduit to Swan Lake.

Pittsburg, Pa.—A reservoir will be constructed near Glencoe for the purpose of furnishing a supply of water at that point. The reservoir will have a capacity of 2,000,000 gallons and will be constructed within the next two or three months.

The question of constructing water works will be voted on at the following places: Pittsford, N. Y., May 4; Upper Alton, Ill., Brookhaven, Miss., May 10; Holly Springs, Miss., Martin, Tenn., May 4; Albany, Ind., Blackhawk, Col., Monticello, Fla.; Alden, N. Y.

The question of constructing water works has been favorably voted on at the following places: Baxley, Ga.; Holland, Mich.; Frederick, Md.; to increase water supply; Champlain, N. Y., W. P. St. Maxens, village clerk; Mabel, Minn.; Florence, Col.; Summerville, Ga.; Manteno, Ill.; Yarmouth, Me.

Altoona, Pa.—(Special.)—Harvey Linton, city engineer, says water mains, 18-8-6-inch, will be laid in portions of Crawford, Bell, Walton, Eighth, Seventh, Howard and other streets during 1897.

Renfrew, Ont.—(Special.)—Complete plans and specifications have been prepared for gravity, power pumping and steam pumping plants, estimated to cost respectively $71,000, $57,596 and $50,400. The town council have voted to adopt the steam pumping plant. Alexander Potter, New York City, designing engineer.

Yardley, Pa.—(Special.)—Plans have been prepared for a system of water works estimated to cost $17,000. Supply shallow wells and pumping to steel reservoir. Alexander Potter, designing engineer, New York City.

Plano, Tex.—Bids will be received until May 15 for constructing a water works system. Address Mayor.

West Point, Miss—Sealed bids will be received until May 11 for constructing a system of water works. C. L. Jordan, mayor.

San Beach, Mich.—Sealed proposals will be received until May 15 for constructing a water works system. B. F. Browne, village clerk.

Union, S. C.—Bids will be invited soon, according to press reports, for a water works system. F. M. Carr, chairman water works commission.

Chagrin Falls, O.—Sealed bids will be received until May 11 for constructing a water works system. J. W. Hitchinson, clerk water works commissioners.

McMinville, Tenn.—Bids are asked until May 18 for constructing a water works and electric light plant. J. C. Biles, chairman water commissioners.

Warmsprings, Ore.—Sealed proposals are invited for the construction of a water works and sewerage system. James Cowan, United States Indian agent.

Buffalo, N. Y.—Bids are asked until May 6 for completing the tunnel from the pumping station to the inlet pier. R. G. Parsons, secretary board public works.

Cleveland, O.—Bids are asked until May 19 for the construction of water tube or other types of high pressure-boilers. George R. Warden, director public works.

Chicago, Ill.—Sealed proposals will be received until May 3 for laying private drains in certain streets and avenues. Check $200. L. E. McGann, commissioner public works.

St. Paul, Minn.—Sealed proposals will be received until May 3 for erecting a 10,000-gallon pumping engine at McCarron lake pumping station. John Caulfield, secretary board water commissioners.

Boston, Mass.—Sealed proposals will be received until May 4 for laying about 111,000 feet of 36-in. cast iron water pipes in Malden, Melrose and Stoneham. William N. Davenport, secretary Met. water board.

Holyoke, Mass.—The contract for building the new water main was awarded, April 20, to P. M. Lynch, for $24,065.

Greenup, Ill.—The contract for building a water works system was awarded to Waltz & Ward, for $13,254.80.

Boonville, N. Y.—Hallinan Bros. & Fenton of Little Falls, secured the contract for a water works system in this city for $36,175.69.

Pittsburg, Pa.—The contract for building the Highland reservoir was awarded, April 10, to Jonathan Clark & Sons, of Chicago, for $419,386.

Laytayette, Ind.—(Special.)—The contract for the new 6,000,000 gallon pump was awarded, April 2, to Henry P. Worthington, of Brooklyn, N. Y., for $28,000.

Plainfield, N. J.—(Special.)—F. A. Dunham, C. E., says: The contract for constructing a system of water works for the "Water Witch Club," Highlands of Navesink, N. J., with pumpink station, reservoir, etc., has been awarded to Nathan J. Conover of Freehold, N. J. An artesian well will be used for a supply.

BRIDGES.

Natchez, Miss.—Bids are asked until May 5 for erecting steel bridges. John F. Jenkins, clerk board of supervisors.

Reading, Pa.—The Burks county commissioners contemplate building two iron bridges to replace wooden bridges.

Columbus, O.—The county commissioners have been asked to build a bridge across the Olentangy at Doddbridge street.

Wolfboro, N. H.—Proposals are asked for a steel bridge across Sawyers, in Harts. Address Chas. F. Piper, Wolfboro.

New Haven, Conn.—The movement to erect a bridge across West river at Kimberly avenue is still under consideration.

Buchanan, Va.—A new steel bridge will be erected to replace the present wooden structure over James river.

Richland, Mich.—An iron bridge is proposed to replace the wooden bridge across the river. J. W. Nickerson, supervisor.

Worcester, Mass.—F. A. McClure, city engineer, is making plans for a 150-foot iron or steel bridge across Lake Quinsigamond.

Belton, Tex.—The construction of a 200-foot highway bridge is contemplated for this spring. E. T. Tucker, city engineer.

Newport News, Va.—The common council decided April 20 to build overhead bridges at Twenty-fifth and Thirty-fourth-sts.

Scranton, Pa.—A bridge is proposed at Carbon-st. crossing, from Ash to Diamond, about three-quarters of a mile, at an estimated cost of $60,000.

Hillsboro, Tex.—The commissioners' court has decided to build fourteen new steel bridges to replace those destroyed by high water.

New Philadelphia, O.—Bids are asked until May 14 for an iron sub-structure over Stillwater creek, between Dennison and Uhrichsville. C. E. Brown, County Auditor.

Rockport, Ind.—Bids are asked until May 13 for constructing a bridge across Honey creek, in Hammond township. C. H. Wright, Supt. Bd. Co. Comrs.

Hazlehurst, Miss.—Bids will be received until May 3 for constructing an iron or steel bridge 178 feet long over Saddlers creek. J. D. Damperer, County Clerk.

Toronto, Ont.—The time for receiving bids for three steel bridges over the Queen street subway has been extended to May 18. R. J. Fleming, Chairman Board Control.

Torrington, Conn.—At a special town meeting, held April 17, it was voted to build a new bridge across the East branch stream on N. Main street at a cost of $4,800.

Pawtucket, R. I.—A resolution was passed by the Woodlawn Improvement association, April 22, to agitate the erection of a bridge at Woodlawn, spanning the Consolidated company's railroad.

St. Charles, Mo.—Bids will be received until May 11 for one 20-foot span girder bridge for the city and two 36 and 50-foot span truss bridges for the county. Geo. L. Anderson, engineer.

Kansas City, Mo.—Bids are asked until May 5 for the substructure of the proposed bridge over Anderson avenue on Independence boulevard. Geo. E. Kessler, secretary board of park commissioners.

Cincinnati, O.—Sealed proposals will be received until May 8 for the construction of substructure of aqueduct for the Miami canal over Mitchell avenue, Millcreek township. Fred Bader, president Hamilton county commissioners.

Watertown, N. Y.—(Special.)—C. O. McComb, city engineer, says bids will be received until May 7 for a steel arch, 168 feet between abutments, and a stone arch, width of roadway, 28 feet, and sidewalks, 6 feet each; total width, 40 feet. J. B. Wise, mayor.

Lebanon, O.—Sealed proposals will be received until May 10 for a stone or concrete arch bridge across Turtle creek on Broadway. Bids will be received at the same time for the substructure and superstructure for a low steel truss bridge. I. N. Walker, county auditor.

Portland, Me.—Bids were received April 20, for the new Turkey bridge, as follows: Variety Iron Works, $76,410; New Columbus Bridge Company, $76,500, $78,000; Boston Bridge works, $69,300, $73,000; Youngstown Bridge Company, $75,412, $79,420; Wrought Iron Bridge Company, $70,200, $72,000; Berlin Iron Bridge Company, $69,950,$73,650; Toledo Bridge Company, $75,950, $76,350; Groton Bridge Company, $76,900; New Jersey Steel and Iron Company, $76,000. The contract has not been awarded.

PARKS.

Malden, Mass.—The land on Ferry and Walnut streets will probably be taken for park purposes.

Baltimore, Md.—Land will be purchased for Hopkins park and Claflen park will be enlarged.

Mauch Chunk, Pa.—A driving park will be located along the Rockport turnpike. N. R. Williams interested.

Taunton, Mass.—A plan for a new park at Blake's Landing has been made by City Engineer Dean.

Chicago, Ill.—The proposition to issue $5,000,000 for the Lake Front park will be submitted to a vote of the people.

Utica, N. Y.—A fine park has been donated to this city, in the Seventh ward by the daughters of the late James Watson Williams.

Tarrytown, N. Y.—Improvements have been begun on a park of 200 acres at Kaakout for John D. Rockefeller of New York City.

Quincy, Ill.—Plans for a new park of about seventy acres on the Bluff are being considered by the Park and Boulevard Association. E. J. Parker, president.

Cleveland, O.—The extensions and improvements in the park and boulevard systems that are being made this year will prove very valuable and useful.

Gloucester, Mass.—A new bill has been prepared by City Solicitor Russell to have the Stage Fort property converted into a public park or state reservation.

Philadelphia, Pa.—The extension of the trolley road to West Chester will result in the construction of a new suburban park at Castle Rock, about eight miles from this city.

Newark, N. J.—John Gogart and N. F. Barrett, the landscape architects of the Essex county park commission, have been authorized to proceed in the preparation of plans for the new north and south parkways.

Cambridge, Mass.—A motion has been adopted making an additional appropriation of $50,000 for the park department, and an order was adopted April 16 for taking the land along the river front for park purposes.

Dorchester, Mass.—A bill has been favorably reported for the appropriation of $100,000 for the construction of a parkway connecting Franklin and Marine Parks by means of Columbus and Boston streets.

Waltham, Mass.—Surveys have been made by the Metropolitan Park commissioners, along the banks of the Charles river, preparatory to the extension of the park system along the banks of the river.

New Haven, Conn.—A meeting will be held May 5 for the purpose of deciding on the division of the old town funds for park purposes. The sum of $15,000 is to be devoted to the improvement of the city park.

Buffalo, N. Y.—The councilmen voted April 12 to beautify Niagara square and $400,000 will be raised on long term bonds for this purpose and for improving Humboldt park, the Front, the South Buffalo and other parks.

Jersey City, N. J.—The street and water and finance commissioners have under discussion the proposed acquisition of park sites. A plot overlooking the Hudson river and New York City on the east and Hackensack Valley on the west, was purchased April 7 for $42,500. It is considered one of the finest park sites in Hudson county.

STREET CLEANING AND SPRINKLING.

Ipswich, Mass.—A street sprinkler is needed.

Amherst, Mass.—The purchase of a street sprinkler is contemplated.

Canton, O.—(Special.)—The question of a garbage disposal plant is again being agitated.

Toledo, O.—The council has decided to ask bids for removing and disposing of garbage. Mayor Major.

Berkley, Va.—A motion to purchase a street sprinkler was referred to a committee for investigation April 22.

Brooklyn, N. Y.—Plans are being prepared for a garbage crematory in this city for the Brooklyn Sanitary Co., at a cost of $150,000.

Boston, Mass.—As soon as necessary data

can be obtained on which to base proposals bids will be received for permanent sprinkling.

Burlington, Ia.—Bids will be received until May 3 for the collection and disposal of garbage. P. O. Nauman, President Board of Health.

South Bethlehem, Pa.—Winkler Bros. of South Bend, Ind., were awarded the contract for furnishing a 500-gallon sprinkler for $300.

New York, N. Y.—The Sanitary Construction Co., 56 Pine street, has been awarded a contract for erecting a disinfecting plant for the Bellevue hospital.

Salem, Mass.—The contract for sprinkling the streets was awarded to Williams, Hamlin Bros. & Welch for $4,104, April 22. The contract shows a reduction of $1,300 over last year.

Ellis Island, N. Y.—Bids were received April 19 for a garbage crematory as follows: Ryan & McFarren, 126 E. Twenty-third street, New York, $300; J. F. Kelly, 116 University Place, New York, 395; B. Mullen, 1111 Willow avenue, Hoboken, N. J., $440; Aetna Construction Co., 27 Trinity Place, New York, $448; G. Stanton, 119 Worth St., New York, $425.

St. Paul, Minn.—Contracts were awarded April 15 for sweeping the asphalt-paved streets at lower prices than last year, being $6,000, against $8,000 for less pavements cleaned last year.

Columbus, O.—The board of public works awarded to the Indianapolis Street Cleaning Co., April 23, fifty-three contracts for sprinkling and sweeping sections of paved streets. Other contracts for sweeping and sprinkling were awarded to William Evans, J. & P. Owens, G. & C. Geigele, Charles Hamilton, W. F. Smith and Frank Thone.

TOO LATE FOR CLASSIFICATION.

Denver, Col.—Petitions are in circulation for asphalt paving on Fourteenth, Sixteenth and Eighteenth avenues.

Springfield, Mass.—The sentiment in favor of brick paving for Main street, between Emery and Carew, is growing stronger.

St. Paul, Minn.—The contract for constructing a sewer in Summit avenue, from Griggs to Oxford, was awarded, April 22, to P. J. Ryan for $1,167.

Anderson, Ind.—The question of a pure water supply is receiving attention and a filter and standpipe have been recommended as the only solution to it.

Athens, O.—Sealed proposals will be received until May 4 for paving with brick or block Mill street, Morris avenue and College street; certified check, $200 each. W. B. Golden, clerk.

Chicago, Ill.—Plans for the new intercepting sewer system were completed by Commissioner McGann, April 27, and as agreed upon, a saving of about $330,000 over former estimates will be realized.

Bluffton, Ind.—Hon. Hugh Dougherty, Geo. F. McFarren, L. C. Davenport, Jas. McCormick and Abraham Simmons, after visiting Muncie, Anderson, Indianapolis and Dayton, O., have reported to the city council in favor of asphalt paving for Main, Market and Washington streets.

Atlanta, Ga.—Paving is contemplated for Auburn avenue, from Butler street to the Boulevard. The residents on Forsyth street decided on brick paving, April 19. A portion of Washington street will probably be paved with the Williams wood block.

Columbus, O.—Sealed proposals will be received until May 7, Douglas street, from Broad to Oak, with asphalt, stone block, Hayden or Hallwood block, or other vitrified brick or block, with a 5-inch curb of Berea or Fulton stone; certified check, $100. Jas. A Fanning, clerk.

Denver, Col.—F. O. Blake & Co. secured the contract for asphalt and brick paving on the Fourteenth street viaduct, April 24, and the Youngstown Bridge Co., the contract for steel cylinders at $3,375. The asphalt paving contract aggregates $20,200 and the brick $13,950.

Boston, Mass.—Bids for building section 50, of the Metropolitan sewerage system, in Melrose and Wakefield, were received April 24, as follows: James J. Newman, $21,463.35; Frank L. Allen, $20,129.50; Cheney & Trumbull, $19,452.80; E. W. Emerson & Co., $19,004.50; T. E. Lynch & Co., $18,474.60; A. W. Byrne Construction company, $17,764.80; Charles G. Craib, $17,113.50; Vincent Soloman, $16,985.68; Aab & Co., $16,656.02; S. W. Frescoln, $16,438.72; John Booth & Co., $14,899. The contract has not been awarded.

Rochester, N. Y.—Bids were received April 23 for paving Tremont street with macadam, as follows: William Fuller, $2,911.75; Whitmore, Raeber & Vicinus, $2,750.55; Charles B. Wagoner, $3,093.50; Gilbert Brady & Co., $2,888.25; Chambers & Casey, $2,881.75; H. B. Hooker, $3,006; Horace T. Oliver, $2,821.50; William H. Jones & Sons, $3,126.25. Bids were received also for laying cement walks. Chambers & Casey for the Davis street cement walk bid 14 cents a lineal foot, while the other bids varied from 42 to 60 cents a lineal foot.

The construction of water works systems is contemplated at the following places: Bartlett, N. H.; C. H. George, water commissioner—Fowlerville, Mich.; Armada, Mich.; Lincoln, Mass.; Center Hall, Pa.; Elkins, W. Va.; Carthage, N. C.; W. H. McNeill, secretary—Hawesville, Ky.; What Cheer, Ia.; Meeker, Col.; Clinton, Mont.; Barton Heights, Va.; Eastman, Ga.; Cass City, Mich.; Coloma, Mich.; Marcus, Wash.; Yolo, Cal.; Petersburg, Va.; new supply; Dexter, Minn.; Summit, Miss.; Sanbornville, N. H.; Siloam Springs, Ark.; Hearne, Tex.; Wenatchee, Wash.; Antonio, Cal.; Neosho, Mo.; London Mills, Ill.; Wadena, Minn.; Renovo, Pa.; Valley Junction, Ia.; Farley, Ia.; Braceville, Ill.; Greenport, (L. I.) N. Y.; Tiverton, R. I.; Rockville, Conn.; South Glastonbury, Conn.

Willis Shaw, contractor's machinery, No. 506 New York Life Building, Chicago, Ill., has just shipped a carload of hoisting engines and rock drills to the Southern California Mountain Water Company. He has also secured an order from Venable Bros. of Atlanta, Ga., for an 800-foot span suspension cable way for their granite quarries. Other recent sales reported by him are: Two channeling machines to Flynn & Co., at Philadelphia; 56-ton steam shovel to A. J. Twiggs at Augusta, Ga.; crushing machinery to the Dessau Company at Iron Mountain, Michigan, and hoisting and quarrying machinery to Watkins & Hardway, Tallassee, Ala.; Williams & Schmidt, Granville, New York, Mathews & Keith, Manitowoc, Wis.; Consolidated Stone Company, Chicago, Ill., and G. R. Root, Buckingham county, Va.